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The ELECTRICAL REVIEW

FOUNDED 1872

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The
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Index to Advertisers—Page xi. Classified Advertisements—Supp. 19. Official Notices-Tenders—Supp. 28 & 30.

Principal Contents:

	PAGE
Recording Engineering Data. By G. Maxfield	738
Hydro-Electric Operation	739
Industrial Distribution. By D. Rudd	741
The Earthing of Low-voltage Installations	743
The Survival of the Fittest?	744
Meetings and Discussions	746
Change-overs in Hairdressing Saloons	748
Correspondence: Cheap Electricity?; All-electric Houses; Motor-car Voltages; Safety with A.C.; The Value of Qualifications; Emergency Greenhouse Heating; Unity in Selling; A Refrigeration Section Proposed	749
Differentiation between Consumers	750
New Apparatus and Devices	751
Electricity Supply Finance	753
Speeches at the B.E.A.M.A. Dinner	754
Cardiff Engineering Exhibition	755
Business and Industrial Notes	756
Electricity Supply	760
Traction	761
Communications	762
Transport Developments in Greater London	762
Contract Information	763
Notes	764
Our Personal Column	765
Financial Section	766
Patent Specifications	769
New Work for Contractors	770

Private Electrical Enterprise

PLENTY of food for thought was placed before those who attended the luncheon of the Batti-Wallahs' Society last week. In order that it may reach a far larger audience we reproduce on a later page an ample abstract of the speech delivered by Sir Robert Renwick, who is prominently associated with electricity supply companies.

We do so because we believe it will come as a relief from the monotony of too frequently reiterated views regarding the electricity supply situation and outlook to read the spirited contribution of a qualified representative of private enterprise who, like his father before him, knows what the industry owes to company enterprise in the early days, and who is fully alive to the possibilities of business between now and fifty years hence, "when a comparative saturation point" may be in sight.

The history of electrical development could be turned to to furnish proof of Sir Robert's opinion that much of the adverse criticism levelled at our electricity supply management is due to the atmosphere of "local politics" that has surrounded it. Not a few of our readers will be quite prepared to endorse his statement that electricity supply statistics of different countries have been misused to support evidence of the electrical backwardness of Britain.

There will also still be found a good deal of sympathy with his view that only harm can come to the industry from undue interference or by preventing it from working out its own salvation. It is quite right and proper that somebody should occasionally raise his voice reminding us, in these rationalised days, of the pioneering work of the early electric lighting companies and the later big power companies which to-day are serving our industrial areas so well.

The speaker's references to the life of plant, cables and switchgear remind us, amid the rapidly changing circumstances of technical practice and experience, of the days when so much attention had to be devoted to the difference between the terms "depreciation" and "obsolescence," especially as affecting municipal electricity accounts, and the necessity for ample provision to be made for both.

Matters have moved at such a pace in recent times that Sir Robert sees that even our present views regarding depreciation will have to undergo marked revision during the next few years. He quoted examples of what is happening in this connection. A boiler plant installed in 1928 at a cost of £75,000 was sold as scrap for £4,000 in 1935. A great high-pressure cable experiment, running into millions, cost very large sums for reinforcement after a few years, instead of running for its "official forty years." Fears of the revolution in h.p. distribution occasioning supersession and scrapping of switchgear on a large scale were also mentioned. Private enterprise, whether in electricity supply or in manufacturing, does not evade its responsibilities in such matters.

That distribution is a local question and not a national one is the view of the speaker, and for certain districts he advocated the formation of "alliances" between corporations and companies for mutual co-operation and development, technical and otherwise, with the Electricity Commissioners as the final arbiters in case of dispute.

Private enterprise and able Corporation officials working together for the good of each other, instead of all working on their own, was one of the closing notes of this very suggestive speech.

Cause of the Wimpole St. Fire

THE use of d.c. seems to have been initially responsible for the recent fire in Wimpole Street, W., when five lives were lost. The evidence given at the inquest by Mr. A. J. McColgan, of the Home Office, is reasonably conclusive in tracing the origin to a very small stray current from the negative wire, which had given rise to electrolysis (perhaps extended over a period of years) at a bend of an adjacent lead water-pipe. The consequent erosion led to the formation of a pin-hole in the pipe and saturation of the wood casing carrying the wires, and

this caused deterioration and ultimate breakdown of the insulation. It is supposed that similar action took place also in an adjacent lead gas-pipe, and that the escaping gas was ignited by a spark from the wiring. The coroner indicated the best precaution against similar outbreaks in his advice to consumers to call in contractors periodically to test their installations. I.E.E. Regulation No. 411 (A), which precludes the use of wood casing immediately below water-pipes, does not envisage an instance of this kind. Here the casing, although above the water-pipe, was exposed to a spray that was more destructive than condensation would have been.

The Manufacturers' Dinner

THE B.E.A.M.A. dinner was a brilliant affair. Though it was the first function since the death of Mr. Dunlop, and the principal theme was the depressed areas, the proceedings were brightened by the always genial presence of Lord Derby in the chair, while Mr. Ferranti and Lt.-Col. Morcom added to the interest by their brief speeches. The large company present included many governmental and other public men, whose main interest in the electrical industry is that of buyers rather than producers. The evening provided Sir Harry McGowan with an opportunity for outlining proposals for organising and financing remedial measures in the distressed areas. The scheme will require for its planning and execution the minds of some of the expert Government officials who know the problems and difficulties, and of some of the industrial authorities who are qualified to explore the specific possibilities of manufacture in the areas concerned. Though Sir Harry regards the electricity grid as a wonderful conception and example of national-scale co-operation, he strongly deprecates the introduction of any semblance of Government interference or control with his finance scheme for establishing new industries.

The Grid and After

MR. V. Z. DE FERRANTI found it impossible to refrain from indulging in a little pleasantry at the expense of the Central Board when he mentioned the keenness of its buying methods while the grid was under construction. Still, he admitted that the Board had handled its business wisely and well, and it is clear that if the manufacturers did not get all that they might have hoped for out of it they obviously survived without permanent injury. Mr. Ferranti spoke of the genesis of B.E.A.M.A. from the reckless competition which was prevalent in the early years of this century, and claimed that all this was a thing of the past. Undoubtedly there has been considerable improvement in the past few years, largely due to internal reorganisation, but also due to a lessening of foreign competition because of our abandonment of the gold standard and the institution of import duties. Greater harmony at home has certainly been a very important factor, and complaints regarding cut-throat, uneconomic competition have become far less frequent of late. The accounts of many leading concerns have reflected this improvement. May they continue to do so!

Commonsense about Prices

COLONEL MORCOM again delivered one of his gently ironical speeches in proposing the health of B.E.A.M.A.'s guests. His theme was the wicked buyer, who, blind to his own real interests, set the sellers against each other, with ruinous results. He claimed that a strong trade association, able to maintain reasonable prices, was of the greatest benefit to humanity. This is undoubtedly true. What is the use of a buyer obtaining a cheap article if when he needs "service" he finds that the people who sold it to him have gone out of existence because they overdid the price-cutting? And it is very often the case that articles which are bought at too low a price need a great deal more service than the sellers are able or willing to provide. So we still maintain "*Caveat emptor,*" in spite of Col. Morcom's inversion of the tag.

A.C. and D.C.

WE are, of course, in entire agreement with Professor B. C. Chatterjee in urging, as he does in our correspondence columns, that every practicable means should be adopted for reducing the risk of shock. That we in Great Britain have achieved some measure of success (due in part to the adoption of sound installation methods) can be deduced from the statistics issued by the Electricity Commissioners. Although much more than twice as many kWh is sold by undertakings now as was sold ten years ago, and the use of a.c. has increased so largely at the expense of d.c., the number of fatalities in industry, the home and collieries has remained substantially the same. We may conclude from such authoritative figures as are available that the proportion of the total consumption in Britain that is used as d.c. is probably under 15 per cent.; yet last year the fatalities ascribed by the Factory Department to a.c. (at less than 250 V) is eleven and to d.c. two, one of the latter being at 110 V. This does not imply that d.c. is less safe than a.c., but it does indicate the need in practice to take other things than voltage into account. Generalisations based on figures so small as those for electrical accidents (compare the thirty-one fatalities in industry due to electricity last year with the 165 in our streets in one week recently) are of little value, but small as they are, they should be reduced. In special circumstances where a low voltage is necessary to ensure safety, transformed a.c. presents the easiest means to this end.

Information Wanted

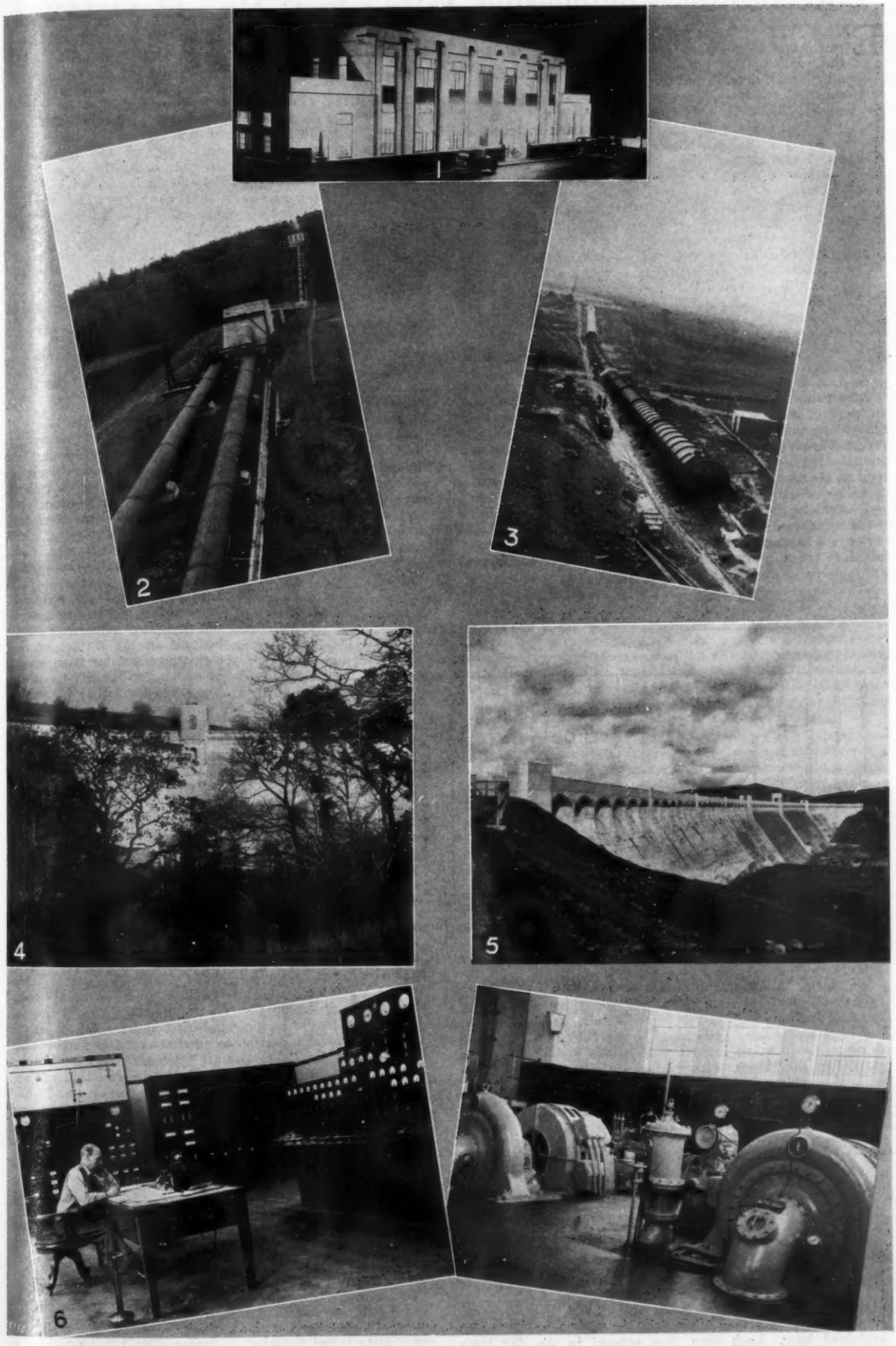
DR. T. E. ALLIBONE, when delivering his and Mr. F. R. Perry's I.E.E. paper on the standardisation of impulse-voltage testing, requested operating engineers to give their experience of surges due to lightning. The subsequent discussion was maintained at a high level, but the operating aspect was not dealt with. Most of our information on the practical aspects now comes from America. While lightning is more in evidence there, it is nevertheless the chief source of trouble with high-voltage overhead lines in Great Britain. Perhaps operating engineers who have any useful information on the subject will contribute their ideas to the ELECTRICAL REVIEW.

Gas and Electricity

ONE or two recent events have thrown into prominence a matter of some concern to those who wish to see the unhindered advance of electricity. We refer to the subject of municipal ownership of both gas and electricity undertakings. The importance of looking at this from various aspects has led us to devote attention to the question on page 744 of this issue, where a list of the towns involved is given. Another gas-electric matter of considerable interest is the Eastbourne case reported on page 750.

Saving Eyesight

RECENT researches at the National Physical Laboratory have considerably influenced the views of ophthalmologists on the relation of adequate artificial lighting to sound eyesight. It has been authoritatively stated that after forty years of age we need 40 per cent. greater illumination for reading, and that about 20 per cent. of school children and 75 per cent. of those over fifty have defective eyesight. Usually the effects of eyestrain are not realised until it is too late. We need not only more candle-power but also suitable means of using it, and that means thought in the design and selection of fittings. The proposal of the London County Council to set up a committee composed of lighting engineers and eyesight specialists to investigate the subject is a move in the right direction.



Some Further Views of the Galloway Water-power Scheme. (See page 739)

1. A night view of the Tongland station. 2. Pipe line to Glenlee, showing the governor equipment. 3. Branch connection between the tunnels from Loch Doon and the Water of Deugh. 4. The Tongland horizontal arch dam. 5. Clatteringshaws Dam. 6. Control room at Glenlee. 7. Small horizontal turbo-alternators at Glenlee.

Recording Engineering Data.

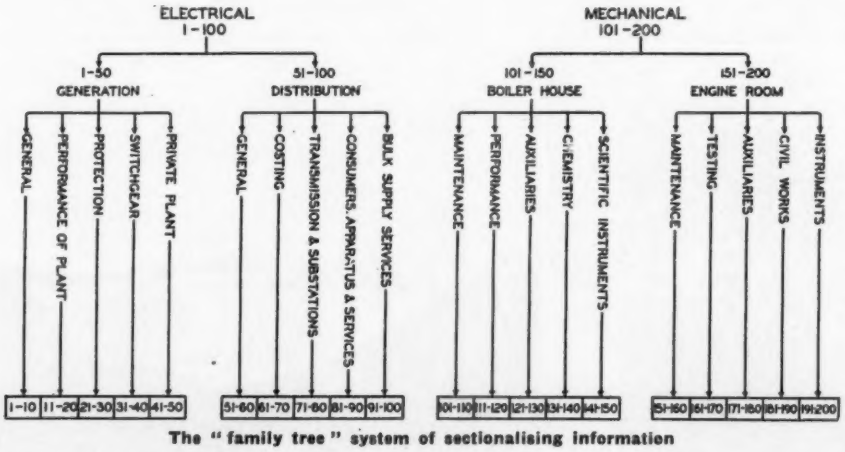
By G. Maxfield, A.M.I.E.E.

A simple and reliable method of preserving essential information

EXECUTIVE engineers require encyclopædic knowledge in the execution of their duties. Training and experience have a high market value, but they must be supplemented by the experience of others as recorded in text books, articles and journals. Full use of the information contained in these can be made only if the owner knows where to find it at short notice. Journal cuttings are of more direct utility than text book material.

A beginner, or one engaged on strictly routine or departmental work, is unlikely to lose his bearings on what may be termed the streams, rivers or narrow estuaries of knowledge, but sooner or later by promotion he has, as departmental head, to face a sudden broadening of outlook—the estuary of knowledge spreads out to an ocean and navigation then becomes necessary. He is expected to know everything about some things and something about everything, *e.g.*, law, economics, finance, surveying, specifications, estimates and all departmental work to which he has been unaccustomed. This need not worry him if he has taken the precaution, during his previous career, of amassing, filing and indexing all the information that he has handled, and if he keeps it up to date. I have found the method described below to be a reliable way of keeping, in an orderly manner, all kinds of odd cuttings from journals, articles, makers' literature and institution papers and to provide an easy and entertaining spare-time job yielding a cumulative return. The advantages over the usual filing system are many, and the " snags " which are usually encountered are absent.

Everything may be segregated according to size. Nothing need be rejected as being too inconvenient for filing. All odd sheets are kept in a maximum of twenty covers. A single and separate index book covers the whole sphere of mechanical and electrical engineering so far as the owner cares to develop it.



The " family tree " system of sectionalising information

Combination of Three Systems

The scheme is a combination of the three well-known methods applied in offices and libraries; *viz.*, the letter book, day book and decimal systems. The day book is the first one to compile. In it, all items to which it is desired access are entered as they come to hand, stating the title of the article with the volume and issue, if the whole journal is to be filed. Thus an odd sheet taken out of, say, the *Electrical World*, would be placed directly in the appropriate folder as explained later. Each item thus entered in the day book is given a number.

METHOD OF USING THE DAY BOOK

Earlier Reference Similar	Earlier Reference Same	Later Reference Same	Later Reference Similar	No.	Subject	Journal Vol. and Issue
	122	133	130.126	123	Protection of a.c. systems.	I.E.E. 62/331 58/291 58/293
		134	132	124	Application of high steam pressures.	I.E.E. 66/383
		128		125	Pyrometers and resistance thermometers.	I.E.E. 70/420
34. 123	121	127		126	Tests on grid lines.	I.E.E. 70/420
	126	131		127	Useful life of transmission mains.	I.E.E. 70/420

A diagram is now prepared after the manner of a " family tree," with numbers allocated to different subjects. The " tree " is then converted into a more adaptable form with plenty of space for entering numbers in line with each heading selected. The equipment so far accounts only for journals which are to be kept intact and put away complete, but it cannot yet cope with the odds and ends which most engineers delight in tearing out and stowing away. This is achieved as follows: About twenty files are each divided into ten sections by separating panels. This can be done cheaply with double foolscap or more elaborately by purchasing this type of file. These 200 pockets are capable of still further sub-division, but usually this is not necessary until many years have elapsed. Separators and folders are now numbered in accordance with the " tree " originally drawn up.

Unlimited Scope

As odd pages are extracted from books it is necessary only to select the number allocated to the subject, endorse the article with that number and put in the filing basket. These need not be entered in the day book, as the material is readily found under its file number by consulting the " tree." When further sub-division of the pockets becomes necessary, the numbers break up into tenths, *e.g.*, 105.1, 105.2, 105.3, and any degree of analysis would be possible by using a second decimal.

SUBJECT INDEX: PROTECTION (21–30)

File No.	Day Book Reference No.
21	Generators—39, 118, 142.
22	Transformers—45, 98, 101.
23	Feeders—133, 186.

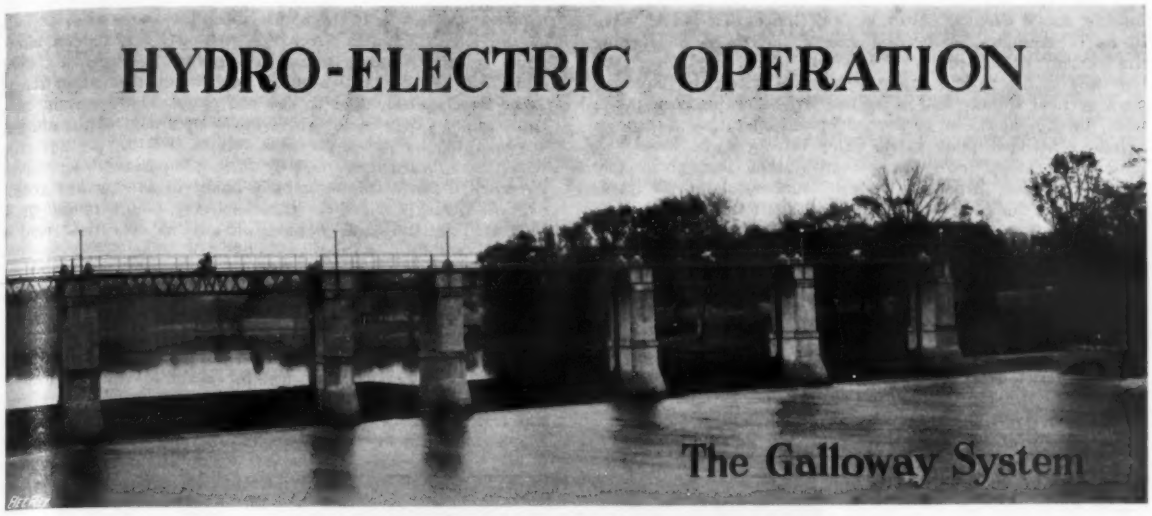
To bring the day book under ready scrutiny and link it up with the general system, each item which has been entered and numbered is treated as though it had been torn out, except that its number only is transferred to a special sheet of paper which is to be found in each pocket. This sheet simply enumerates all numbers of the items bearing on the subject under notice, so that, having consulted the tree and found the appropriate pocket, one can find there either everything bearing on the subject or else a reference number from which, by turning to the day book, one can locate the article. Here one can add a useful refinement in the " fore and aft " numbering of the day book. When the second item on a given subject comes to hand, the number of the previous item is entered in the left-hand column, the number of the second item is entered in the right-hand column of the first item, a third item number is entered in the right-hand column of the second item and so on, so that when a single article has been traced it is an easy matter (a) to find all associated articles, and (b) to detect when the first and last articles on that subject have been reached without having to go through the whole list of titles.

Thus, when tracing backwards the last item is reached when the numbering appears: —/42, and tracing forwards the last item is reached when the numbering appears 42/—. In the case of titles which overlap to some extent, two numbers can be entered in the " fore and aft " columns. If an odd sheet has interesting matter on both sides under two headings and of widely different subjects, the more important one is filed in the ordinary way, the one of less importance being entered in the day book with a note " see file No. X." Although the scheme may seem formidable, actually its back is broken as soon as the equipment is numbered.

A Tropical Testing Chamber

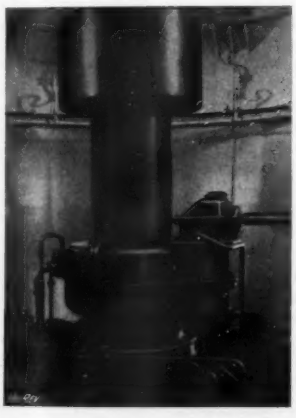
To determine the behaviour and performance of apparatus under actual load and also to discover in what way climatic conditions are liable to affect its efficiency and stability, a special tropical testing chamber has recently been established at the Werner works of Siemens and Halske at Siemensstadt. The atmospheric conditions within the chamber are variable, and even reproduce the temperature changes occasioned by alternations of day and night, which cause dimensional changes in constructional materials, a similar effect being produced in hygroscopic materials by variations in humidity. The testing chamber is equipped with both steam and electric heating, and a hot-water spraying arrangement for moistening the air, which are operated from an adjoining room. The walls are insulated to prevent loss of heat by conduction and have been specially treated to make them impervious to air and water.

HYDRO-ELECTRIC OPERATION



THE capital expenditure authorised by Parliament on the Galloway scheme was three million pounds sterling, or just under £30 per kW. It is expected that the scheme will be completed within this figure, which may be considered as low for a hydro-electric scheme, but it should be remembered that it is designed essentially for peak load operation at an annual load factor of about 20 per cent., although when there is an abundance of water the scheme will run at full capacity as long as such water lasts.

The idea is very widely held that, on account of their comparatively high capital cost, hydro-electric schemes can only be justified if they are operated on base load, and preliminary investigations of the Galloway scheme were made with this conventional ideal in view. Subsequently however, it transpired that by a comparatively small increase in capital expenditure on the plant side of the scheme the civil works proposed could be utilised to operate a much greater capacity of plant on peak load, and it was on a peak-load basis that the scheme was adopted by the Central Electricity Board.



Chamber between turbine and alternator on a main set; electrical and mechanical pump drives left and right

The operation of such a scheme, in conjunction with steam-power stations, naturally demands the closest co-operation between the Central Board control and the company's operating staff, and as a result of this co-operation practically all the water available has been utilised in spite of the fact that only a small proportion of it is under control.

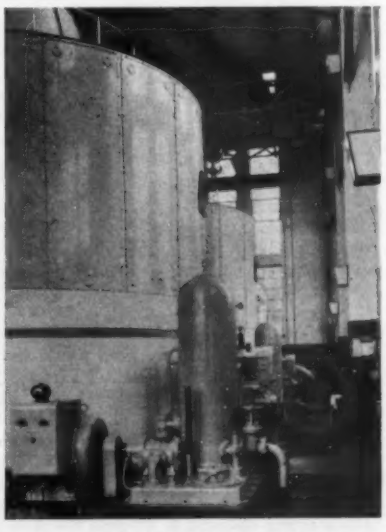
Normal operation over a period is essentially dependent on daily river flows, and in this connection the C.E.B. gives much assistance by its daily forecast of the next day's load requirements, and its efforts to take surplus in times of flood. Each power station has its own seasonal reservoir or daily storage, and Nature often contributes to the operation by way of draining into the daily storages along the way between the main and subsidiary reservoirs.

Loch Doon in the north, with its 2,900 million cu. ft. storage, serves all the power stations on the scheme, except Glenlee. The uppermost daily reservoir for serving the stations formed by damming the Rivers Deugh and Ken above Kendoon station is fed directly from Loch Doon down the Carsphairn Lane and the River Deugh and is the immediate storage for the three stations, Kendoon, Carsfad and Earlstoun. These three stations are designed to be run simultaneously, so that water passing through the turbine at Kendoon from the main storage in the loch formed above this station passes directly to the next two stations, Carsfad and Earlstoun, through their respective daily storage reservoirs, each of which is of sufficient capacity only to allow about one hour's full-load running. It is essential, therefore, that water shall flow into these daily storages in turn from the next higher station to ensure continuous running. Kendoon is an attended station, while Carsfad and Earlstoun are designed to be remotely controlled from Glenlee as mentioned in the first article printed in our last issue.

Actually, we understand, the complete system of remote control for Carsfad and Earlstoun is not yet fully developed in complete detail, but generally it provides for the following sequence of operations, presumably on the impulse current code system. First, the intake gate at the forebay entrance to the aqueduct supplying a turbine is slightly opened in order to fill the aqueduct and the spiral casing of the turbine. When the turbine casing is under pressure an electrically driven lubricating pump starts automatically to feed the turbine lower bearings. When full pressure is reached the intake gate is fully opened through auxiliary contacts and the turbine is run up to speed after a short interval, during which the governor oil pump is run up to working pressure.

After the turbine has attained full speed and has gone into speed control by the governor the alternator is synchronised and the main switch closed, after which load is built up on the machine. Remote-control operation of the two unattended stations is effected from control desks in the control room at Glenlee power station.

The operation of the Glenlee station is quite independent of the other stations so far as the supply of water is concerned for running the turbines, due to its separate supply from the watershed situated among the higher Galloway Hills in the area east of Loch Trool. This water is virtually on tap from the station storage in Clatteringshaws Loch, and the operation of the station from this point of view is, therefore, simple and direct. There is an added advantage in the fact that the station can be run up at very short notice, and this feature is of particular advantage to the Central Board, especially under emergency conditions. From the time a call is received at Glenlee for load this station can be run up and commence feeding into the grid in less than ten minutes.



Turbo sets at Glenlee, showing the governor equipment

The tunnel from Clatteringshaws is provided with an intake gate in a tower situated in the loch at the tunnel entrance. The gate can be raised manually or by motor operation, and in emergency it can be closed by remote control from Glenlee power station. The gate is arranged to close by an out-of-balance bias on the release of a brake by solenoid operation on the headstock of the gate. This solenoid is fed from a 50-V storage battery brought into circuit for a definite time by relay operation.

At the other end of the tunnel, where it emerges on the

hillside above Glenlee power station, there is a portal valve 10 ft. in diameter at the top end of the pipe line feeding the station contained in a building constructed over the pipe line at the tunnel outlet. This is a butterfly-type valve on a vertical spindle and is opened by water pressure taken from the pipe upstream of the valve, and operation is through a hand-controlled pilot valve. The valve can be closed by remote operation from the power station through a trip actuated by the thrustor. On the tunnel, about 230 yards upstream of the portal valve, a surge shaft is provided from the tunnel up to the ground surface, 120 ft. above the tunnel, for taking care of surges which occur when the turbines are closed down.

After discharging from the turbines in Glenlee power station the water enters the River Ken from the tail race canal about a mile south of Earlstoun power station. It is therefore still further utilised as a source of power when it passes downstream to Loch Ken and thence to Tongland power station.

The most difficult section of the scheme to operate from the point of view of water control is Tongland station. Due to the fact that the storage reservoir for Tongland at Loch Ken is about eight miles from the power station, it is necessary to release water through the barrage gates at Glenlochar at the foot of the loch some hours before the water is required at Tongland for generation of power. The loads to be carried by Tongland station have, therefore, to be arranged for beforehand.

A part of the fish ladder at Tongland

With the exception of a small amount of local supply given from the power station to Kirkcudbright County Council, the bulk of the load is fed into the Central Board's lines through the Board's adjacent sub-station.

In the case of Tongland the estimated loads to be given by the Board for the following day are communicated to the control engineer in the power station, so that suitable flows are released from Glenlochar (illustrated in the heading block) at times to suit the varying loads. As Tongland station, in common with the other stations of the company, is essentially a peak-load station, the loads given are mainly at times of maximum demand on the grid. During periods of heavy rain, however, it occasionally becomes necessary to run the station all day. Under ordinary dry-weather conditions use is required to be made of the local storage provided in Tongland Dam to equalise load conditions to the allowable rate of flow in the Dee between Glenlochar and Tongland Dam.

This reservoir has a storage capacity equal to two hours' full-load running of the station. Along the river upstream of the dam there are areas of flat land which are liable to flooding when high-water level conditions in the river exist. It is therefore necessary to regulate flows in the river to such an amount that flooding of low-lying adjacent land is avoided as far as possible. The normal flow in dry weather is therefore limited to about half of the full load of the station, and the capacity of the reservoir is made use of for increasing the water flow to the station to meet peak loads. When a peak-load run commences, therefore, the water level behind the dam will be at about full level. This level is gradually reduced during the run owing to the restricted flow down the river, and on a prolonged peak-load run it may be reduced to its normal minimum of ten feet draw-off by the end of the run, after which the reservoir refills.

As mentioned in the first article, the gates at Glenlochar for regulating flow to Tongland are operated by remote control from the power station, and the level of Loch Ken and the volume of flow passing the barrage is also indicated on a control board in the station. The gates can, of course, be operated locally by hand. It was also previously mentioned that indication of water level at Tongland Dam is given in the control room at the power station. To take care of heavy flow in the river at the dam, a storm weir (or spillway) is provided on the east side of the river which leads into a storm channel to by-pass the flow past the dam. For exceptional storm flows two storm gates are provided in addition. These gates are motor-operated and are arranged to open to a predetermined extent automatically by a float and electrical control mechanism when the flow over the spillway reaches a depth of just over 2 ft., after which further opening is by motor operation under hand control.

At the lower end of the aqueduct the water passes through the concrete base of a concrete and steel surge tower (100 ft. in diameter and 91 ft. high) in which the water rises or falls as the load fluctuates. A surge created by a sudden shutdown results in water rising in the tower and flowing over and down a bell-mouth overflow pipe within the tower itself, to be finally discharged to the tail race. The remotely controlled inlet valves in the valve house upstream of the station are operated by an oil-pressure system (300 lb. per sq. in.), which is, in turn, governed by solenoid-operated pilot valves governed directly from a control board in the turbine room.

The scheme provides for three delivery points to the grid, two at Tongland and Glenlee, already in operation, and a further switching station at Kendoon. The Kendoon connection serves for Carsfad through a 132-kV interconnector, and the supply from Earlstoun is fed down to Glenlee in a similar way.

In many respects the water-power operations are not confined purely to running turbines. The Galloway company has to guarantee, for instance, for æsthetic reasons, a flow of twelve million gallons of water per day past one spot on the Blackwater of Dee, a few miles down from Clatteringshaws, and in a dry summer this often necessitates releasing water from the Clatteringshaws reservoir through a needle valve in the dam. Other duties will devolve on the company, too, in connection with the fishery interests.

An important consideration bearing on the operation of the scheme as a whole is the provision of facilities for the Dee salmon to gain access to the uppermost parts of the streams in the company's area for spawning. Indeed, requirements of the Scottish Fisheries Board have had a definite influence on the development of the scheme right from its initial stages.

Fish ladders situated at the lower waterway obstruction on the river are the facilities provided for the salmon, and the ladder at the Tongland dam is believed to be the highest in the country. Virtually, it is a flight of actual water steps, with about 2-ft. lifts, contained in a concrete frame. A suitable inlet and an outlet in the wall of each step proves the necessary intercommunication throughout the ladder and from the stream to the reservoir. Automatically operating sluice gates under float control in the wall of the reservoir and communicating with the upper end of the ladder separately provide for the correct flow of water, with variations of the water level in the reservoir.

Only the first stage of the scheme, embracing Tongland and Glenlee, is at present in operation. We wish to acknowledge our indebtedness to the Galloway Water Power Co. for permission to publish this information, and particularly to Mr. F. H. Williams, the manager, and Mr. J. Warnock, assistant manager, for their patience with us in our endeavours to obtain an understanding of the workings and operation of the scheme during a somewhat hurried tour.

A New Theatre Lighting System

A NEW system of automatic lighting control and colour equipment has been installed in a luxurious theatre and lecture hall, which has been built for the benefit of the 6,000 workers at Rowntree's cocoa and chocolate works, York. The Joseph Rowntree Hall, as it has been named, is equal in design and equipment to the most modern of West End theatres. The theatre has seating accommodation for 450 people. The stage lighting installation has been installed by Holophane, Ltd. The stage is provided with a plaster cyclorama which is illuminated by three colour equipment at the top and bottom, whereby almost any known shade of colour may be obtained. The acting area of the stage is well illuminated. No 1 stage batten is of a special type employing 300-W lamps instead of the usual 150-W lamps, and special reflectors are employed to concentrate this light in the desired area. The apron of the stage is illuminated by means of a battery of spotlights concealed in the front of the balcony, and by means of special colour change spotlights projecting their light through openings in the auditorium ceiling. Portable equipment for the stage includes multi-coloured wingflood trolley units on rubber-tyred wheels, portable groundrows, and various projector lamp and arc spotlights. The selector stage switchboard has been specially designed for this installation and is believed to be probably the most advanced stage lighting control board yet made. The auditorium is illuminated by a special reflector equipment concealed in ceiling coves, running parallel with the width of the hall. These coves increase in brightness towards the stage opening.

Industrial Distribution.

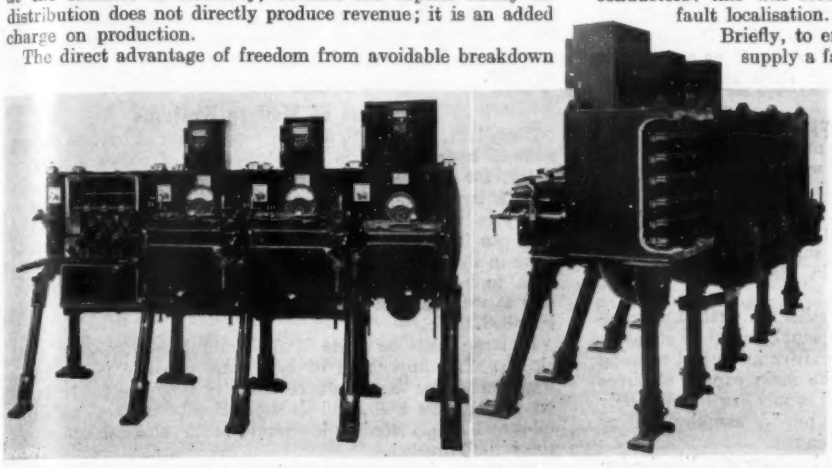
By D. Rudd, B.Sc., A.M.I.E.E.

Factors that promote continuity of supply in a works

QUITE apart from the complex arrangements made by supply authorities to reduce the effect of breakdown in their own networks, it is often desirable for a consumer to make similar provision to localise trouble in his installation. Electrical breakdown, as such, cannot entirely be prevented; but precautions can be taken, first, to limit the extent of a fault and, secondly, by controlling the conditions in which the plant runs to prevent the development of circumstances known to be favourable to the occurrence of a fault.

This important part of a production plant too often does not receive its due measure of consideration, and on the score of "economy" all refinements are rigorously excluded, even at the sacrifice of efficiency, because the capital outlay on distribution does not directly produce revenue; it is an added charge on production.

The direct advantage of freedom from avoidable breakdown depends upon an intangible factor, namely, the cost of unreliability; this, in turn, depends upon the importance of the plant which will be affected by a shut-down at any particular point in the installation. The result is that the purchaser, faced with a choice between low first cost, or a greater cost to cover an unassessable risk, chooses the devil—he knows—that of low first cost.



A distribution switchboard with duplicate bus-bars and selector isolating switches (left) and a works switchboard with duplicate bus-bars

Any industrial installation should be planned and equipped in such a manner as to limit the damage that may be caused by a fault; limit the area affected; reduce the risk of fire from electrical causes; provide the maximum safety for workeople; and ensure a constant service. This protection is afforded by the switches, protective devices and kindred apparatus employed; by choosing apparatus of the right type and of unquestioned reliability; and by designing the distribution system so that, in those cases where the importance of a circuit merits it, an alternative route of supply is provided.

Providing for Extensions

It is not suggested here that the degree of complication necessary in supply authorities' networks is either desirable or appropriate in the average works installation, nevertheless, there are many cases in which a consumer can secure safety in the distribution system itself by the lay-out adopted, and by the type of equipment installed.

A practical difficulty is that a works installation is usually the product of many years' natural growth, difficult to forecast and to provide for at the beginning. Even so, similar and more acute difficulties are encountered and overcome in designing supply networks. Once the principle of safety has been accepted it is no more difficult to extend on these lines than in the more usual haphazard manner.

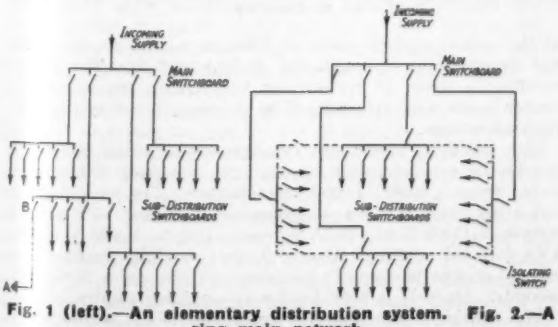


Fig. 1 (left).—An elementary distribution system. Fig. 2.—A ring main network

The elementary distribution system shown diagramatically in fig. 1 has the following advantages:—It is essentially simple, and therefore cheap; it does not involve the use of complicated switchgear or protective devices; in situations where the short-circuit kVA is high, the relatively heavy switchgear on the main board can be designed to deal with this, and the rupturing capacity of breakers on sub-distribution boards remote from the incoming feeders can be reduced; each switchboard can be situated at the centre of gravity of its own load.

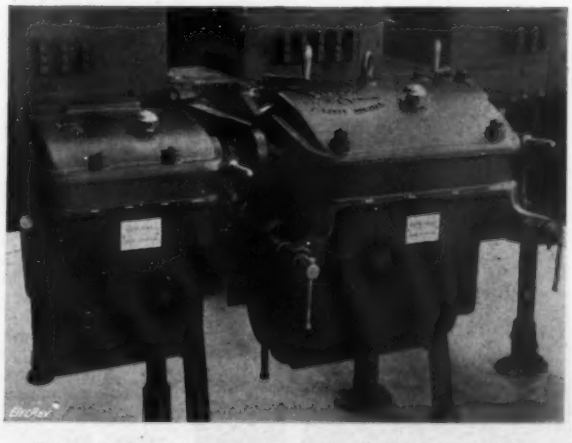
As a rule some form of over-current protection will be provided wherever a change is made in the sectional area of the conductors; this will secure a measure of discrimination or fault localisation.

Briefly, to ensure the minimum interruption in supply a fault should be cleared at the nearest control point, and sound sections of the system should be unaffected. Thus, a fault at A should be cleared at B without disturbing the system from the source of supply up to that point. This involves at least some form of graded over-current protection, the simplest method by which discrimination can be obtained. While it may not give true discrimination between the limits of current represented by a small overload on one hand and a dead short-circuit on the other, this method is a very practical compromise, and gives useful discrimination in conditions of overload or minor faults. The disadvantage of losing discrimination in the event of a dead short-circuit is more apparent than real, for such a fault will inevitably produce a major disturbance.

The main disadvantage of the scheme shown in fig. 1 is that, should one of the feeders fail, all supply is cut off from those parts of the network fed from the faulty section, the extent of the shut-down being more serious the nearer the faulty section is to the source of supply, but this risk can be reduced by providing an alternative path for at least an emergency supply.

Duplication of Feeders

With simple feeders this can only be done by duplicating those essential to the running of the plant. These would normally run in parallel, either being of sufficient size to carry the emergency load. This parallel running will involve some complication in the protective devices required. A fault in a single feeder can be cleared by opening the switch at the supply end, but when feeders are run in parallel it is necessary to provide automatic switches at both ends of each cable. In addition to the usual over-current or over-current and leakage protection at the supply end of each feeder, it becomes necessary to provide reverse-current relays at the remote end of the feeder as well.



Internal circuit-breakers (incoming feeders) controlling alternative supplies

The effect of parallel feeders may be achieved without dupli-

cating any one of them, by providing interconnectors between the bus-bars in the sub-distribution boards so that any combination of main cables may be used to feed any, or all, of the sub-distribution boards, if suitable arrangements for switching are made on what is, in effect, a kind of ring-main system.

Each feeder requires over-current and reverse-current protection; and some form of isolating switch, preferably of a design suitable for opening and closing on load, is needed in the ring main between each switchboard. By using this system the risk of permanent shut-down is confined to feeders from the sub-distribution boards.

The complication in protective apparatus required by a ring main may, in a measure, be avoided if simple interconnectors are used to link the bus-bars of selected switchboards. Where these are used only to provide an emergency supply to a switchboard in the event of its own feeder failing, feeders from the main switchboard need not be paralleled and protection will not be required at the remote ends. This arrangement is quite effective, although not so elastic as a full ring main, particularly when only two or three sub-distribution boards are involved.

Alternative Supplies

In an extreme case it may be necessary to provide an alternative supply. The most common example of this, in industrial practice, is that of a public supply being taken as an alternative to private generating plant, although in special circumstances a supply undertaking may lay two feeders from different sub-stations. When the supplies can be run in parallel the system can be treated in the same way as one with duplicate feeders.

If the supplies cannot be run in parallel the method of treatment will depend on (*a*) whether one supply is a pure standby, or whether it can be used an an alternative in normal running conditions (for example, to assist the main supply at times of peak load); (*b*) whether the second supply can be used only for a limited purpose (for example, to provide standby lighting in the event of the main supply failing).

When it is necessary to energise the bus-bars of a distribution switchboard from one supply or the other at will, this can be done either by means of a change-over switch or by using interlocked incoming circuit-breakers. This prevents both supplies being used together, but to change over from one supply to the other involves a complete shut down of the plant, if only momentarily.

Alternatively, duplicate bus-bars can be provided in the distribution switchboards, each set being energised from one supply. The outgoing circuits can be fed from either set of bars by interlocked selector isolating switches or, if the switchgear is of the draw-out pattern, by providing duplicate sets of sockets, into either of which a circuit-breaker can be plugged. In this way both supplies can be used at the same time, but precautions must be taken to see that they are not paralleled at the remote ends of the various feeders.

While it is desirable, in order to preserve a continuous supply, to link the various sections in a distribution system as closely as possible, there are practical limits beyond which it is inadvisable to go. One reason is that, if carried to excess, it may be found difficult to localise faults effectively; moreover, the consequences of such faults will be felt throughout the whole installation. Another reason is that permanent interconnection, which has the ultimate object of providing as many current-carrying paths in parallel as possible, also has the undesirable effect of reducing the natural impedance in series with a fault, and consequently tends to increase its severity.

Problem of Modern Systems

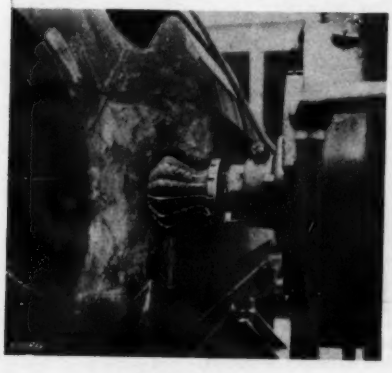
Nowadays, the growth and interconnection of modern supply systems have resulted in a concentration of power impossible to forecast a decade ago. A consumer whose works are situated near a large sub-station may find himself bound to provide heavy and costly switchgear to deal with the short-circuit kVA that can feed a fault on his premises. Anything that can be done in the design of his own distribution system to limit the kVA to be broken will have a considerable bearing on the size as well as upon the cost of the switchgear which is to be installed.

Full use must be made of the natural impedance of every circuit. The impedance of long runs of cable is of double importance, for the resistance tends to keep the power factor on short-circuit high, and as the difficulty in breaking in an oil-switch is increased by low power factor, this helps to relieve the circuit-breaker.

In these circumstances it is desirable to sectionalise the installation as far as possible, and to use the minimum number and size of feeders between each section and the source of supply. Even so, there is no reason why provision should not be made to link sections together in time of emergency. If need be, precautions can be taken to ensure that both supply paths are not in use at the same time.

A Large Synchronous Condenser Plant

THE synchronous condenser installation at Chevilly, near Paris, in the terminal sub-station of the 220-kV transmission lines from the Massif Centrale hydro-electric plants is said to be the largest of its kind in Europe. There are two machines on solid insulated blocks, each mounted on a single shaft and comprising the condenser proper, a synchronous-induction starting motor, the main exciter and a pilot exciter. The condensers are fed directly at 11,000 V three-phase, 50 cycles and can produce 45,000 kVA at between 11,550 V and 10,450 V at 500 r.p.m. forward, and half that amount running reversed. The ratio of the short-circuit to no-load excitation current is 1.4, thus ensuring stability for running reversed, the excitation current for 22,500 kVA at 10,450 V being, it is stated, 10 per cent. of that required when the machine is running at no-load.



Milling a rotor

The stator is built up of thin laminations in groups separated by radial ventilating ducts and the conductors are laminated bars. On the rotor shaft is a sleeve in two parts on to which thick steel discs are shrunk. Radial grooves milled into these discs enable the air to penetrate the whole machine. The conductors which are spaced a few millimetres apart to assist ventilation are straight pieces of copper welded together at the edges, so that pieces of different widths can be used; the method also increases the cooling surface. The buffer winding is made of rectangular bars which are welded to copper hoops and is arranged to be capable of starting at reduced voltage.

A general view of the two synchronous condenser sets installed at Chevilly

The starting motor (a synchronous-induction machine) obtains its synchronising current from the main exciter and is fed from a 10,500/1,000-V transformer. The main exciter has a laminated stator and compensated winding. Its normal output is 150 kW at 175 V, corresponding to 11,000 V 45,000 kVA forward running. One of its two windings supplies the normal excitation current; the other can give 440 V for thirty seconds. Its field is provided by an auxiliary exciter.

The machines are supplied from the 11-kV windings of 220 kV/60 kV/11-kV transformers, the 220-kV winding which is connected to the feeders from the Massif Centrale, and the 60-kV winding to the transmission network of the Paris region. Each transformer is composed of three single-phase groups of three windings.

The Earthing of Low-voltage Installations

Features of various systems and their fields of application

AUTOMATIC safeguards against failures to earth should ensure that a breakdown of wiring or apparatus between live conductors and the metal casing does not cause the potential of the casing to rise sufficiently above that of the earth to create danger from shock and risk of fire or waste of energy. A publication by Messrs. A. Reyrolle & Co., Ltd., discussing "Safety in Urban and Rural Consumers' Low-voltage Installations" reviews the solid earth, core-balance, earth-trip-switch and dual- and multiple-earth systems, and delimits their fields of application.

The ability of a protective system to prevent dangerous strong voltages and sustained leakage currents depends largely upon the resistance of the consumer's earth electrode. Such electrodes are divided into two classes, namely, (A) those having an earth resistance of one ohm or less (usually cold-water mains or lead sheaths of supply cables), and (B) those having an earth resistance of above one ohm and up to five hundred ohms (usually iron pipes driven into the ground). The resistance of the sub-station earth electrode must also be taken into account). If this does not exceed two ohms the system is regarded as solidly earthed; above two and not exceeding fifty ohms it is resistance-earthed. A system must not become unsafe because of a single defect.

The Solid-earth Method

The essential features of the solid-earth system are (1) the enclosing of all live conductors in metal casings; (2) the bonding of such casings solidly together and to adjacent metal by an earth-continuity conductor connected to an earth electrode at one or more points; and (3) over-current devices in series with the live supply wires. The two conditions for safety in this, as in all systems, are the limitation of the stray voltage to 40, so long as the earth current is less than the operating current of the protective devices, and the isolation of the faulty apparatus or wiring on breakdown at 230 V. To comply with the first condition the consumer's earth resistance must not exceed 40 divided by the over-current setting. The second condition requires that the sum of the impedances of the consumer's and the sub-station electrodes must not be greater than that which permits the earth current to exceed the over-current setting. In practice, the first condition is met if the second holds, which usually entails solid earthing at the sub-station. The conclusion drawn is that solid earthing should be used with class A consumers' electrodes, mainly in urban districts, but that if the earth-circuit impedance is too high to permit a current to flow exceeding 1.5 times the over-current setting of the protected circuit other production should be added.

The limitation of the solid-earth system that the leakage current must me more than 1.3 to 2 times the normal load current does not apply to the core-balance system, with which isolation is possible by the use of automatic switches operating at currents as low as 2 A when, with a factor of safety of 1.5, the consumers' earth resistance must not exceed 10 ohms and the earth-circuit impedance must not exceed about 76 ohms. The solid-earth system should be supplemented by a core-balance switch in installations with class A electrodes, or with iron-pipe or plate electrodes with a resistance of less than 10 ohms, when the earth-circuit impedance is too high in relation to the over-current setting. The use of pipe or plate electrodes should, however, be confined to installations in workshops and factories.

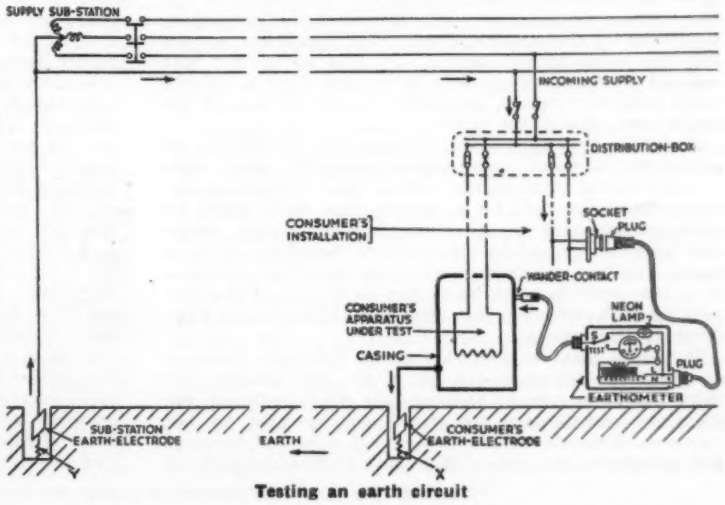
In the earth-trip-switch or artificial-earthing system, which has been described already in the ELECTRICAL REVIEW, the metal casing is connected to earth not solidly as in the other systems, but through a sensitive high-impedance trip coil in series with a normally closed test contact. Owing to the high impedance of this coil, the resistance of the earth electrode has no appreciable effect upon the value of the strong voltage at which isolation occurs and a class B electrode can be used, as in rural districts. The test contact checks the soundness of the trip-coil and of its connections to the earth electrode, but not those between the casing of the protected apparatus and the trip-coil, including the contact. The switch may be put out of action if the casing on the connecting wire between it and the trip-coil comes into contact with a very low resistance earth, which, while not causing danger to life, might cause fire by open arcing. The artificial-earthing system is also a suitable means of protection of apparatus with open elements.

In rural districts an earth-shield between the high- and low-voltage windings of a transformer does not always provide effective protection if the assistance of the earth electrode is high. To guard against the results of a breakdown of windings or of contact between high- and low-voltage overhead lines, where only B class electrodes are available, the "dual-earth" method is recommended. In this case the solid earth system is supplemented by an earth-trip-switch.

Multiple Earthing in Rural Districts

It is suggested that multiple earthing of the neutral (for which the consent of the Electricity Commissioners is necessary), may eventually provide the best solution for rural installations in that it provides safety with maximum standardisation. Under this system the neutral supply wire is connected to earth electrodes at a number of points, giving at small cost a low-resistance earth at each installation. An insulation breakdown to casing is always a phase-to-neutral fault and hence the current is large enough to blow the fire. The consumer's protective devices are the same as for the solid-earth system.

Safety depends upon the maintenance of a low earth resistance no less than upon its provision in the first place, and reference is made to the "Earthometer," a portable earth and polarity tester recently introduced by Messrs. Reyrolle, which was described in the ELECTRICAL REVIEW of June 21st. This enables a test to be made rapidly, not only of the resistance



Testing an earth circuit

earth wiring on a consumer's premises but also of the impedance of the complete earth-fault circuit back to the neutral earth at the sub-station.

South Coast E.P.E.A. Dinner

THE annual dinner and dance of the South Coast Section of the Electrical Power Engineers' Association was held on November 16th at Brighton. The company numbered 192 and among the guests were the Mayor and Mayoress, the president of the Institution of Electrical Engineers (Mr. J. M. Kennedy), and the president of the Association (Mr. C. Cooper), Dr. E. Hughes (principal of Brighton Technical College), Alderman S. C. Thompson (chairman of Brighton Electricity Committee), Mr. W. N. C. Clinch (borough electrical engineer of Brighton), Mr. J. K. Brydges (borough electrical engineer of Eastbourne), Mr. F. Swarbrick (borough electrical engineer of Hove), Councillor R. H. Howard (vice-chairman, Basingstoke Electricity Committee), Mr. W. E. Jones (borough electrical engineer of Basingstoke), Mr. E. Laming (chairman of the Southern Division of the E.P.E.A.), and Mr. W. Arthur Jones, general secretary.

The chairman of the Section, Mr. W. C. Fripp, welcomed the ladies and visitors, Dr. E. Hughes responding. "The Association" was proposed by Mr. Clinch, who spoke of the important part which women were taking in the development of the industry by giving advice as to the domestic applications of electricity. Responding, Mr. C. Cooper said that the membership of the Association was on the increase. He refuted the idea that increased salaries meant a higher cost of energy to the consumer. The dinner was followed by a dance to the music of the Glanville Orchestra, Mr. F. E. Denne acting as M.C.

The Survival of the Fittest?

The problem of the municipally owned gas service

NO secret need be made of the fact that pressure is being brought to bear upon electricity supply undertakings to induce them to increase their business-getting activities by enlarging their canvassing staffs and advertising expenditure. Whatever aggregate scheme may ultimately emerge affecting the country as a whole in these particulars, the subject is receiving public attention in various places, and reports are to hand which bring into prominence some of the difficulties which the Electrical Development Association and the Central Electricity Board are meeting, particularly in places where both the electricity and gas undertakings are owned and controlled by the same municipal authority.

Between three and four years ago, in the course of an article entitled "Britain's Electrical Future" by "Forty Years," (ELECTRICAL REVIEW, July 1st, 1932), the writer ventured to indicate some of the more controversial points that had arisen in the course of a long experience of gas and electrical competition and electricity supply development problems. He said that, taking things as a whole, it was reasonable to suppose that, given free competition between the two agents, electricity would easily be able to win over hundreds of thousands of gas users providing distribution and service facilities were available, assuring them that they could have it with a minimum of trouble.

Continuing, the writer said: "An interesting situation seems likely to develop as the national electrical policy which must consistently follow the completion of the grid comes more actively into evidence, because the gas interests, which raised their voice in protest against the policy in Parliament, will not sit down quiescently if they consider themselves to be placed in an unfair position with the weight of the Government, as represented by the Ministry of Transport, the Electricity Commissioners, and the Central Board, thrown into the scales against them." It was made clear that national electricity supply was to be pushed by a Government authority while a competitor, another section of the community, was in the field.

Much else that appeared in this previous contribution on such points as public *versus* private ownership, the wisdom or otherwise of municipalities selling their electrical undertakings, and the need for a broader view to be taken by all concerned with the future of electricity supply, might well be borne in mind by those who are facing our problems to-day. But we will limit ourselves here to giving expression to a few ideas on what we believe to be one of the perplexities of the moment—that mentioned in the opening paragraph of this article.

To ensure that we shall at once see that this matter is no trivial one let us give a list of the one hundred and thirty-eight cities, towns and boroughs where both gas and electricity undertakings are owned and operated by the municipal authority. Many of these are cities and towns of first importance, and some of them have an excellent electrical record, notwithstanding that the gas undertaking is also carrying on satisfactorily. Both, of course, are engaged in what has long been termed "municipal trading," and they should be conducted efficiently and, if possible, profitably for the good of the community which owns them.

While the engineer or manager is employed by the municipal authority to run the system, it is the councillor's duty to run the affairs of the borough undertakings fairly in the local interests. In ordinary departments of local government he may have little difficulty in deciding matters of policy, but if there are departments with rivalries or clashings such as trading almost inevitably brings he may be in a dilemma if one seeks to make progress at the expense of the other.

Although we are naturally entirely electrical in practice and in sympathy, we feel that it may possibly be found that the soundest electrical policy for the future will only be formed after it has been decided what shall happen to gas departments.

The Electricity Committee may bring forward a proposal for expenditure upon new staff or advertising so as to develop the use of electricity to the utmost. It may recommend low charges and the introduction of all kinds of facilities to attract gas consumers to its mains. The Gas Committee of the same town may come forward with similar recommendations to boost gas and gas appliances. The onlooker might well ask: Why should one be allowed to do so and not the other?

The councillor is on the horns of a dilemma. True, he may know that electricity possesses special merits, but how far is he to be influenced by respective merits or to favour one agent against the other, seeing that the capital for both undertakings has been found by the same body? In short, while the municipal principle is in force, how can proper encouragement be given to two more or less inter-dependent yet competing enterprises?

What is the right course to pursue, then, in such cases? Ought the electricity undertaking to be boosted or given all sorts of inducements to make headway because the Central Board and the grid are a national force urging it forward, and because electricity is possessed of merits making for greater domestic felicity and increased industrial efficiency?

Would it be convenient to close down the gas concern and leave the electricity department without opposition or competition? Have we reached the stage when we can describe gas and gas undertakings as a back number? Can we say that it is the duty of municipalities to resign themselves to scrapping their gas plants, departments and staffs? If that were the case gas securities would be far more out of favour than they are. The most enthusiastic and optimistic amongst us will admit that, great as is its progress, the electric cooker has a long way to go before it knocks out the gas cooker everywhere. Gas for heating and cooking is still widely used, and for certain industrial purposes it can show its suitability with efficiency.

Do we not sometimes overlook the fact that hundreds of thousands of old houses are hardly touched by electrical propaganda efforts? These have little to do with the increase of electricity consumption; the large number of new houses and flats erected during the last five or six years have produced a very substantial increase of load.

The ideas of a certain section of the public are reflected in the view of a man who had invested his life savings in gas securities and when questioned about the wisdom of leaving them there now that he was getting on in years, said that his brokers advised him that his gas investments were quite good enough to last him out with their present yield and at their present value.

WHERE GAS AND ELECTRICITY ARE SOLD BY THE SAME AUTHORITY

Aberdeen
Abertillery
Accrington
Ashbourne
Ashford
Ashton-in-Makerfield
Atherton
Bangor
Barnoldswick
Barrow-in-Furness
Batley
Bedwellty
Bethesda
Bexhill
Bingley
Birkenhead
Birmingham
Blackburn
Blackpool
Bolton
Bradford
Brighouse
Burnley
Burton-on-Trent
Bury
Buxton
Caernarvon
Calne
Carlisle
Chesterfield
Clacton
Clitheroe
Colne
Colwyn Bay
Congleton
Conway
Coventry
Darlington
Darwen
Denny and Dunipace
Dewsbury
Doncaster
Dumfries
Dundee
East Dereham
East Retford
Edinburgh
Falkirk
Gainsborough
Glasgow
Greenock
Halifax
Hamilton
Haworth
Heywood
Hindley
Honley
Huddersfield
Ilkley
Inverness
Keighley
Kendal
Kirkcaldy
Kirkwall
Lancaster
Leeds
Leek
Leicester
Leigh
Lincoln
Llandudno
Loughborough
Lytham St. Annes
Malvern
Manchester
Mansfield
Marple
Mexborough
Middlesbrough
Middleton
Milford Haven
Millom
Morecambe
Morley
Motherwell and Wishaw
Mountain Ash
Mynyddislwyn
Neath
Nelson
Newark-on-Trent
New Mills
Newcastle-under-Lyme
Newton-in-Makerfield
North Berwick
Nottingham
Oldham
Padiham
Paisley
Perth
Pontypridd
Port Talbot
Portland
Prestatyn
Radcliffe
Redcar
Rhondda
Rhyl
Richmond (Yorks)
Ripon
Risca
Rochdale
Rotherham
Rothesay
St. Helens (Lancs)
Salford
Scunthorpe
Shipley
Skipton
Southport
Spalding
Spenborough
Stafford
Stockport
Stockton-on-Tees
Stoke-on-Trent
Stretford
Tain
Thornton Clevelys
Tiverton
Todmorden
Tredegar
Ulverston
Wallasey
Walsall
Warrington
Wigan
West Bromwich
Workington

We, of course, hold that electricity and electricity supply investments will not only last us out, but our children also, and even our grandchildren, unless our scientific friends have something up their sleeves or in their laboratories that they will spring upon us to upset calculations. Electricity supply to-day is an industry whose securities whether they are those in companies, or loans by the Central Board or other substantial authorities, seldom give their holders spasms of anxiety, notwithstanding the critics who say that the grid is far from paying its way. The merits of electricity are really only now becoming widely known; the prospects are very rosy and they will become brighter still as gas is displaced.

It may be asked what profits gas undertakings are making to justify their continuance. Though we have not the figures available it is sufficient to assume that if they were a burden it would soon be considered justifiable to shut them down—indeed, could anything but sentiment save them from that end?

What is the Board of Trade attitude concerning gas interests which come under its purview as electrical interests formerly did? The Central Board and the Commissioners between them may find that electric power stations have to be shut down for our common grid good, but they have no authority affecting gas systems which stand in the way of their supply.

In the recently reported case of Darlington the Finance Committee was disinclined to approve new expenditure on electrical expansion and it asked for the matter to be reported upon by the General Purposes Committee, whose duty it is to weigh up the general question. The Electricity Committee replied that it was being urged by the Central Board to spend money on advertising electricity. If it did not do so—what then? Here there appeared to be fear of a threat of distribution reorganisation and dictatorship; but has the Board, or can the Distribution Committee, exercise any mandate to "knock out" gas? We may be enthusiasts for the loading up of the grid as rapidly as possible but let us not close our eyes to awkward facts.

Happily the railway electrification recently planned will help to the desired end and there is plenty of legitimate electrical development possible in industry as well as in the home.

The Fight Must Go On

We must continue to get a move on and there is plenty of scope for an aggressive competitive policy in hundreds of places where the gas undertaking is a competitor *not* owned by the municipality. It is of little avail to look back to the days when municipalities (like some companies) obtained provisional orders to protect gas undertakings. It will not help us in any efforts that may be made to persuade Parliament to give compulsory powers to one interest to trample on another which is able to show reasons for its continued existence.

Efforts by either the Board or E.D.A. to induce electricity undertakings to progress more rapidly cannot be expected to succeed where what they propose has to be done to the detriment of another department owned by the same authority. An electricity supply company convinced regarding the greatness of its future may, as a business transaction, secure control of a gas company and gradually eliminate its competitive or obstructive influence. The fact of a municipal electrical system competing with a company-owned gas undertaking might put fight into the former, and legitimate enterprise would gain the electrical end that we seek.

The troublesome spot in the situation is municipal ownership, and frequently to-day we are brought bang up against disadvantages, from the public point of view, that we never anticipated when municipalities were seeking electrical powers. There is in many places no room for both undertakings to be successful if electricity is to be allowed freedom to play the part in modern life that its merits justify. We do not believe that any scheme for reorganisation of distribution can have the full measure of success so long as this state of things exists. Why not have a Government investigation to see what the future has in store for the gas undertakings, perhaps forming a Gas Board for the purpose of exercising control over them all?

The Engineer's Position

Let us consider one interesting effect of the double system which is in force in at least 138 places. The electrical engineer may desire to develop his undertaking on up-to-date business lines for all he is worth. But can he help it if his plans for doing so are destined to cause displeasure to, and promote opposition from, the gas undertaking operated by another set of officials in the same employment as himself? He may desire to support E.D.A., to advertise freely, to canvass vigorously, to lower his charges and increase facilities, and so on, but the fact cannot be ignored that the Council are his employers; without their goodwill and approval there is no reason for his existence.

It is his job to run the electricity undertaking to the full limit of his ability, efficiently, and with the co-operation or control of his committee whose duty it is, to show good results; but the Council after all are the owners of the undertaking, as the ratepayers' representatives. They are no less responsible to the ratepayers, however, for the conduct of the operations, and the policy, of the gas system. Why then should they go out of their way to please the Central Board or to utilise E.D.A.? This is the sort of attitude that is bound to be met.

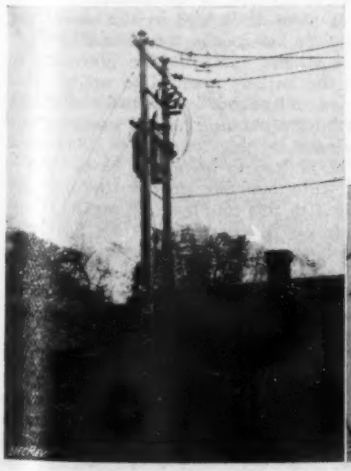
No doubt E.D.A. would find it far easier to raise the revenues it needs and to secure the co-operation of many undertakings were there not this other fly in the ointment—municipal gas competition.

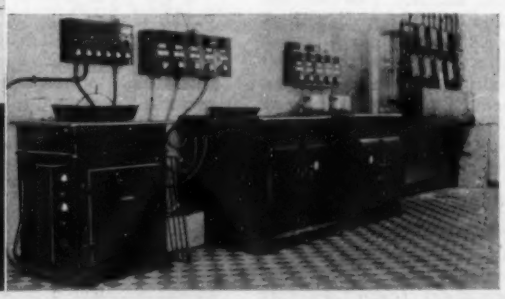
Probably the considerations set forth above have had, or will have, a prominent place in the deliberations of the Distribution Committee. It will be interesting to learn what measures this Committee sees fit to recommend to deal with what is beyond doubt a difficult situation. Will it go so far as to advocate the closing down of some of the 138 gas systems in order that its measures for improving the efficiency of the national electricity supply systems may succeed and Britain become, by virtue of organisation, more speedily electrified than it can possibly become if the gas and electrical methods are to follow gradually the course which will ultimately eliminate one of them?

In other words, can the pace be forced or must things be permitted to take their own course?

Electric Cooking in the Country

AN interesting installation of electric cooking has recently been completed at Tortington Girls' School, which is situated on the edge of the Sussex Downs about 1½ miles from the little borough of Arundel. The whole of the work was carried out by Messrs. Rowbotham & Pinnock, of Bognor Regis, under the supervision of Mr. H. A. Harding, A.M.I.E.E., electrical engineer to the Bognor Gas and Electricity Co., and consists of three 15-kW cookers, six steamers, six tea urns, grillers, and a number of other pieces of apparatus, which, together with a large refrigerator, give a total loading of 105 kW. This is sufficient for the 140 pupils and sixty members of the staff.





Left: The original pole transformer. Right: A part of the kitchen, showing the three 15-kW cookers

Supply is taken from main 11-kV line from Bognor to Arundel, of the Bognor Gas and Electricity Co., and a 30-kW pole transformer was originally erected, but (owing to the enlargement of the school recently) this has now been replaced by an open-air ground-type of 100-kW capacity. A 0.12 sq. in. four-core underground cable has been laid from this point to the main switches in the kitchen, one to each set of apparatus, balanced across the three phases. The load has considerable diversity and voltage drop is negligible.

Gas has been entirely dispensed with, and the annual consumption of electricity is well over 55,000 kWh. The fixed charge is based on the m.d. of the lighting load, which has been agreed upon between the consumer and the company. The energy costs ¾d. per kWh.

Meetings and Discussions

Light-sensitive Cells
Standardising Impulse Tests
National Highway Lighting

Applications of Photo-electric Control

AT the meeting of the London Local Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on November 18th MR. E. W. FORSTER (British Thomson-Houston Co., Ltd.) reviewed photo-electric control, describing the general characteristics of the light-sensitive cell and its applications for industrial purposes. Dealing with time limit switch control, he said that in many cases a beam of light could be used when it was impossible to use a mechanical type of switch. Tolerances as close as ± ¼ in. could be catered for by the use of the general purpose type of relay. A good electrically operated counter could make about 300 operations per minute, although in practice the usual maximum speed was in the neighbourhood of 150 to 200 per minute. Another application was in conjunction with a number of selector switches, so that after any pre-selected number of counts an external circuit could be controlled and the counter reset itself automatically after the desired number of counts had been made.

For switching street lighting on and off according to the weather conditions the range of adjustment was approximately 0.2 to 10 ft.-candles.

The application of the photo-tube to the measurement of temperature was a relatively recent development and had many advantages over existing methods. The response to a temperature of 2,200 deg. F. was thirty-three times greater than at 1,600 deg. F. A simple amplifier circuit was used and a regulating device was incorporated to maintain the amplifier voltage constant. It was also necessary to use a vacuum phototube, since the drift of the latter was less than that of a gas-filled tube, although sensitivity was sacrificed.

The thyratron, or electric-discharge tube, with anode, cathode, and grid enclosed in a glass envelope containing mercury vapour, was intended for fast operation when it was desired to energise some circuit from an extremely short light impulse, of the order of a few thousandths of a second. A thyratron of about the same physical size as a normal radio power valve could control direct circuits of about 250 W and could carry 0.25 A with a circuit voltage of about 1,000.

In the discussion, MR. S. G. NODES was told that the use of photo-electric cells for protecting operators on various classes of machines had been accepted by the Home Office. In reply to MR. E. E. SHARP the author stated that with cathodes made of other substances the relative response was not quite equal to that of caesium. As to life, he mentioned one cell which had been controlling street lighting for a period of one year and was still operating quite satisfactorily. The anode could be made of any material. The life did not fall away suddenly, but did so gradually, and a minimum of about 10,000 hours could be taken as the period for replacement. Mr. Nodes said that he knew of photo-electric cells which had been working satisfactorily for four years.

MR. C. H. DOBELL remarked that photo-electric cells were used for controlling street lighting instead of clocks in two-thirds of the streets of the borough of Hampstead, and a great many of the street lamps in Southwark were also individually controlled in this way. There were light actuated switches on the market which varied very little from the time switch in price. They were particularly valuable for controlling the lighting on arterial roads where the conditions might suddenly become dangerous through fog. MR. J. PARR-MORLEY (hon. secretary) stressed the point that the advantage of photo-electric cell control was that it brought the street lighting into operation according to weather conditions, and not merely at a fixed time, and MR. A. WATSON observed that presumably this involved the consumption of more electricity than if the lighting was brought into use, as usual, at certain hours. Mr. Forster said that more electricity would be consumed during foggy days by the use of photo-electric cells, but the lamps would not be switched on so early on fine days.

* * *

Should Impulse Testing be Standardised?

THE paper referred to last week, in which Messrs. T. E. ALLIBONE and F. R. PERRY (of the "Metrovick" h.v. laboratory) make proposals for the standardisation of impulse-voltage testing, was discussed at the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 21st. The first speaker, Mr. F. H. CLOUGH, said that they could not hope to make machines entirely immune from the effects of direct lightning strokes. But when under the influence of impulses converted to travelling waves of reasonable shapes and dimensions it should be possible in the near future to predict (still at a reasonable price) the behaviour in much the same way as they did now for temperature and overspeed. To do so they would need to apply tests, and the paper showed what sort of tests they should be. He fully endorsed the authors' plea for early standardisation of those tests.

DR. J. H. MILLER stated that there was a very strong case for impulse tests to be applied to transformers and all apparatus connected to transmission lines. For such test measurements the use of oscillographs was essential, and very great care would have to be exercised in defining the wave shapes to be employed. He thought the authors might disagree with his opinion that some insulation did exhibit fatigue due to the tests imposed. For instance, they would definitely weaken and shorten the life of a transformer. When under impulse tests a transformer should be subjected to the steepest wave obtainable, say one-eighth or one-tenth of the three microseconds suggested by the authors.

MR. R. DAVIES fully upheld the authors' plea for the standardisation of impulse testing, and said he agreed with all but a few small points in the paper. The manner in which damping resistance was distributed in the impulse circuit was of importance in relation to the definition of the wave-front shape. He was strongly of the opinion that for measuring high voltages in these tests the cathode-ray oscillograph should be used, and not sphere gaps. Contrary to the authors' statement, the voltage divider could be made to provide useful indication.

MR. E. B. WEDMORE considered that the proper time to compromise for standardisation purposes could only be determined by discussion, and discussion should certainly begin at once. The requirements were not for acceptance tests, but for quantitative and qualitative limits. The authors' suggestions were analogous to battering with heavy rams a house in which large cracks had appeared. Such procedure should be confined to the builder's yard to teach him how to make good walls, and not applied to the finished house already occupied. Sphere gaps had been widely used and almost worshipped, but the difficulties introduced by wide spacing were well known. When small gaps were used the field seemed to be much less subject to disturbance by external influences. Dr. W. M. Thornton had been working on that subject and some of the results obtained would shortly be published.

DR. E. H. RAYNOR said that the authors had made very definite proposals as to the way impulse tests might be applied. Their suggestions carried weight because they had already been discussed to a certain extent internationally. Had the authors tried the radio-frequency detector method of revealing incipient faults due to impulse testing?

MR. E. T. NORRIS pointed out that transformer conditions were quite different from those affecting line insulation and switchgear. The methods described in the paper for line apparatus would not apply to transformer testing. Transformers were subject to two kinds of disturbance. First, travelling waves, such as were dealt with in the paper; and secondly, direct lightning strokes on the transformer itself or very near to it. Direct strokes could not be prevented so easily or completely as the authors seemed to imply. Protection by earth wires was not easy if it was to be complete, *i.e.*, providing zero earthing resistance, which was a remote possibility and not obtainable in this country.

If the tests were to be limited to travelling waves then it would hardly be worth while applying them to the majority of transformer installations in this country. To protect transformers against direct strokes it was necessary not merely to shield their terminals, but also the line and other sub-station parts in the near vicinity, so that the lightning could not get at the transformers. The tests proposed were all that could be suggested in the present state of impulse technique, but they did not represent the stresses that would be imposed by natural lightning. Synchronised 50-cycle power follow-up with each impulse applied was the only means of revealing weakness caused by the impulse tests. Even so, to be effective, large follow-up power capacity was necessary to detection.

MR. C. H. NUNN complimented the authors on presenting so controversial a paper; the discussion which it provoked would lead to the drafting of a national testing specification,

which was desirable. The authors had dealt with transformers in the only way that was practicable. Whether the cost of the tests proposed would be justified would depend upon the real cost of the "outages" that might be prevented thereby. It was not possible to ascertain whether a transformer had been weakened by impulse tests. Even type tests applied to a few which were afterwards dismantled for inspection, which would be very costly, might not be practicable because so many variants were called for. The authors' suggested 20 per cent. margin was insufficient; at least 30 per cent. would be necessary, for materials and oil were bound to age with use and the number of impulses experienced in service would be far greater than those applied on test. Tests on transformer bushings had revealed the curious result that the watt loss was not appreciably increased after the first impulse test.

DR. T. E. ALLIBONE, in reply, contended that it was surely better to suggest something sensible now rather than have something entirely non-sensible forced upon them later by those in a position to demand special tests but who did not really know just what they wanted. The standardisation suggested was only intended to be provisional and subject to modification by experience. Sufficient impulse testing had not yet been done to indicate definitely whether insulating materials were subject to fatigue or not. Porcelain fatigue was not of the same kind as that exhibited by steel; it was probably initiated by the formation of a very minute crack, too small to be detected.

* * *

Views on Street Lighting Administration

THE paper on the necessity for, and administration of, public lighting by Mr. E. C. LENNOX (to which reference was made last week) was discussed at a meeting of the ASSOCIATION OF PUBLIC LIGHTING ENGINEERS at the Public Works, Roads and Transport Congress in London on November 19th. Dr. GILBEY, secretary, Ministry of Health Street Lighting Committee, said the Ministry would be glad to get some direct evidence of the relationship between street accidents and lighting. All that existed at present was a great deal of half evidence, which did not lead to very definite proof that bad lighting was a serious cause of street accidents. A report issued by the Massachusetts Highways Department regarding accidents seemed to him more convincing than any others he had seen and was worth careful study.

With regard to the author's recommendation that lighting powers should be transferred to large administrative bodies and that grants should be made from a central fund to meet the cost of street lighting, Dr. Gilbey said that everybody was probably hoping that the necessary Parliamentary action would be taken on these lines as soon as possible. The Ministry of Transport had no powers to make any grants or to take any action.

In the opinion of Dr. J. W. T. WALSH, of the National Physical Laboratory, the views expressed in the paper were eminently practical and commonsense. Dr. Walsh said he preferred to base his pleas for improved public lighting on the more general grounds of the convenience of the vehicle driver and the user of the roadway than on statistics. Councillor J. USHER, Chester-le-Street, agreed on the need for co-ordination. He said that the lighting of the Chester-le-Street by-pass road involved that district in a rate of 2½d. in the £. That road had been constructed by the Durham County Council, but the cost of lighting it fell upon a poor mining district with a rate of 20s. in the £, although not five per cent. of the local people used the by-pass. Surely it was time that the lighting of such roads was dealt with and financed from some central source? Mr. W. J. MERRITT, county surveyor of Durham, remarked that the County Council was not a lighting authority, and it could only act to a very limited extent. The arterial road through Chester-le-Street formed part of the Great North Road from England to Scotland, so surely this was a matter which should be dealt with from the national point of view.

Alderman E. SHIPMAN, chairman of the Works Committee of Lewisham Borough Council, said that local councils, when trying to decide which was the best type of lighting to be adopted for a particular circumstance, felt a need for some independent central authority's advice. He added that better lighting in the main streets of Lewisham had resulted in higher speeds on the part of motorists, and it was a question how far improved lighting conditions really made for greater safety. Councillor W. MOGGERIDGE, of Weymouth, said that, in his district at any rate, there were county councillors who had never lived in a town and were quite unaware of the difference in the conditions. They still seemed to have the parish pump in one hand and the parish lamp in the other. County Councils should not be allowed to interfere with borough authorities in the matter of street lighting, but they should pay their fair share towards the proper illumination of main thoroughfares.

Replying to the discussion, Mr. Lennox said he disagreed with the view that the greater speed permitted by better lighting led to more accidents. If more of the important roads were better lighted the traffic density would be distributed more evenly and the accident rate must fall.

* * *

A Comparison of Gas and Electric Furnaces

THE development and future possibilities of town's gas as an industrial fuel, particularly for heat treatment and melting furnaces in the iron and steel, and non-ferrous metal industries, are discussed in a paper by Mr. J. E. WHITE which was read at a joint meeting of members of the North Western Section of the INSTITUTE OF FUEL and the MANCHESTER DISTRICT ASSOCIATION OF GAS ENGINEERS at Manchester on November 20th. The author is the industrial sales manager of the Newcastle and Gateshead Gas Co., which offers two-part tariffs as well as special contract rates.

Mr. White admits that six years ago it became alarmingly apparent that for continuous heating processes the design of gas-fired furnaces would have to be modified and improved if they were to compete with their electrically heated rivals. The result of re-designing furnaces for the carburising process is shown by the appended table, which represents a comparison during a full week's operation, with gas at 2s. per 1,000 cu. ft. and electricity at 0.6d. per kWh. Still better performance is claimed with a gas cost of 8.8d. per hour, or 0.079d. per lb. of product treated, which the author compares with electrical costs of 12.3d. per hour, or 0.113d. per lb. of material treated.

	Old design.	New design.	Electricity.
Total load	13,890 lb.	13,032 lb.	14,703 lb.
Fuel consumption, total ...	93,450 cu. ft.	44,310 cu. ft.	2,780 kW.
Consumption per hour ...	795 „	415 „	20.5 kW.
Consumption per lb. ...	6.73 „	3.72 „	197 Wh.
Cost per hour	18.9d.	9.88d.	12.3d.
Cost per lb.	0.160d.	0.089d.	0.113d.
Time occupied	117 hr. 45 min.	106 hr. 50 min.	135¼ hr.

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Single-line Railway Signalling

The paper by Mr. H. BIRCHENHOUGH which was read before the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS on November 27th describes how by suitable signalling many double-track lines which have never worked to full traffic capacity can be operated as single tracks with little or no reduction in the flow of available traffic. This procedure has been carried out by the Great Southern Railways of Ireland, about 220 route miles of double track being singled. At each end of the section is a token instrument containing a supply of tokens. The two instruments, being electrically connected by line wire, are so interlocked as to permit the use of only one token at a time, thus ensuring safety. A token can be obtained from either instrument with the co-operation of the signalman at the other instrument, who sends the necessary releasing current. While this paper has been confined to a detailed description of the electrical train staff and key token system on single-line sections, it is not to be inferred that these methods are to be preferred to the tablet system and the key token system associated with it, which perform similar functions with equal success and safety. The various systems are frequently used to operate successive sections, alteration of the type of token being considered to provide an additional safeguard in rendering the probability of the confusion of tokens of adjacent sections to be as remote as possible.

* * *

Feedwater Treatment

A paper on some aspects of steam boiler feedwater treatment by MR. J. S. MERRY, of the Feedwater Specialists Co., Liverpool, was read before the BELFAST ASSOCIATION OF ENGINEERS on November 27th. The mechanism of scale formation inside boilers is discussed, the author describing how steam bubbles are encouraged to form by any small unevenness or projection on the heating surface. As the bubble grows in size it leaves a film of water in contact with the heating surface on one side and with steam on the other.

Steam is a bad conductor of heat; consequently the passage of heat through the film is retarded and its temperature is raised. Since the solubility of some salts decreases with temperature rise, they are thrown out of solution and deposited in the form of crystals around the bubble. Accordingly, if it

(*Continued at foot of next page.*)

Change-overs in Hairdressing Saloons. By D. W. Mackie

FEW supply engineers had any idea of the variety and quantity of electrical apparatus in use in hairdressing establishments before the present era of "change-overs" gave them an opportunity of finding out. Much of it is of a highly specialised nature and, furthermore, new types are being introduced each year.

The majority of ladies' hairdressing saloons are personally conducted by the owner, not by a manager, and it is generally found more difficult to persuade such persons to do without their apparatus during the period when it is being altered to suit the new supply. This is particularly the case with regard to permanent-waving machines, as most of these small businesses possess only one and rely upon its use every day for a very large part of their business. Another point that should be borne in mind is that the ladies' hairdressing business has certain seasonal busy periods, varying in different districts, but generally from May to August and again in November and December. For this reason change-overs taking place during these periods will cause the greatest inconvenience to the hairdresser and may possibly involve him in much financial loss.

Apparatus in common use comprises permanent-waving machines, hair-dryers, high-frequency sets, vibrators, hair-clippers, "Marcel" irons and iron heaters. Of these, the most important are the permanent-waving machines and hair-dryers, which are in constant use in most saloons, and are essential to the running of any hairdressing business. There is a great variety of permanent-waving machines, but practically all consist of a collection of small heating elements, each of which is wound on a metal or porcelain former, the whole group being arranged on a portable stand of some kind. These small heating elements are wound for a fixed voltage (usually stamped on them), and for the successful accomplishment of a permanent wave by one system or another it is essential that they shall reach a definite temperature in a certain fixed time. This definite timing and temperature is necessitated by the use of various chemical reagents in the permanent-waving process, and any appreciable variation from the voltage for which the heaters are wound will alter this temperature and thus upset the whole process. They are not, of course, affected by a change-over from d.c. to a.c. where the voltage remains the same, but when any alteration in voltage takes place they must be rewound. The portable stand of the permanent-waving machine does not usually call for alteration, as it is merely a convenient arrangement of sockets or lamp-holders for connecting the heaters to the supply.

In some makes the heaters are supplied at a few volts only by means of a step-down transformer incorporated in the machine. Where such machines are used on d.c. the transformer is fed from a small rotary convertor of about 1 kW capacity. On a change-over to a.c. this convertor is, of course, dispensed with, but it is usually necessary to fit a new transformer, as the primary voltage of the existing one will be much under standard voltages owing to the d.c. to a.c. voltage ratio of the convertor. On a.c. supply where a change-over in frequency from 25 to 50 cycles takes place it will usually be found that the transformers in these l.v. machines will operate quite satisfactorily at the higher frequency.

Hair dryers are to be found in one form or another in every hair-dressing saloon. The type most commonly used is the large hood dryer which may be fitted with a universal motor. A series commutator motor is generally employed, and this is wound for certain fixed voltage ranges, namely, 200 to 220 V and 230 to 250 V. Motor speed variation is employed in many hood dryers, this being effected either by series resistance or tapped field coils.

Where the motor is known to be universal there is, of course, no need for any alteration on a change-over from d.c. to a.c. provided the new voltage is within the same range. Some of the single-speed motors, however, have separate field tappings for use with d.c. and a.c. When the motor is run off a d.c. supply the a.c. tappings will be found taped up outside the motor end-plate. On changing over such tappings care must be taken that the ends of the unused ones are insulated from each other, or a portion of the field winding will be "shorted" out. This arrangement is not practicable in the variable-speed motor controlled by field tappings, and where such motors are used it will generally be found necessary to have the motor rewound for use on an a.c. system.

[Jerome

Mr. Mackie is in charge of the Electrical Service Department of Eugène, Ltd.

Practically all the makes of hand dryers are fitted with single-speed universal motors. During a change-over of the voltage range, such as from 200 d.c. to 230 a.c., care must be taken that the heating elements of any dryers affected are altered to suit the new voltage, as these elements are made in ranges similar to the motors. If this point is overlooked the elements will become too hot, the dryer supplying air at a much higher temperature than it was intended to, resulting in complaints.

A change-over in frequency from 25 to 50 cycles also affects the running of these dryer motors, especially the hood dryer types, and here again it will generally be necessary to have these rewound to suit the new frequency if satisfactory running is to be obtained.

Of the remaining apparatus in hairdressing saloons, small vibrators and hair clippers are almost always fitted with universal motors. High-frequency sets are also mostly universal, and are made to be used on a very wide voltage range. Electrically heated "Marcel" irons and iron heaters, being simply heating elements, are not affected by a change-over in current, and are often provided with variable resistances to allow them to be used on a fairly wide voltage range.

It may be of advantage to know the loadings of the various pieces of apparatus; while these vary somewhat with different makes all have approximately the same average. Permanent-waving machines take from 800 to 1,000 W (or 30 to 40 W per heater). Hood dryers have a loading of 1,000 to 1,200 W, and hand dryers from 500 to 700 W. Vibrators, electric clippers and high frequency sets are usually under 100 W.

Meetings and Discussions (*Continued from preceding page*)

could be arranged that the steam bubble formation could take place in the bulk of the water rather than on the heating surfaces, the precipitation of the salts would occur away from the heating surfaces, and the former would be maintained in the form of a sludge rather than a scale, because it is now generally recognised that hard scale is formed *in situ*. Bubble formation is promoted by anything which will act as a nucleus. If, therefore, we introduce into the boiler water a sufficient number of nuclei upon which bubbles can form, we shall have done much to inhibit the accumulation of hard incrustation on the heating surfaces. It is for this reason that the use of colloids is coming into increasing prominence for the conditioning of boiler feedwaters.

* * *

Utilisation of Creep Data

The main purpose of the paper by Mr. R. W. BAILEY which was read at the INSTITUTION OF MECHANICAL ENGINEERS in London on November 22nd is to outline what the author considers to be a rational basis for the design of engineering parts under creep conditions (occurring in metals at elevated temperatures) and under any system of stress in a form that is linked directly with the case of simple tension. Methods of test developed by the Metropolitan-Vickers Electrical Co., Ltd., are described for ascertaining creep behaviour under tensile stress, and general expressions for creep under any system of stress include the case of tension and permit the results of tensile creep tests to be utilised in the design of parts under complex stress. Stress distribution in parts creeping under a general system of stress can usually be determined when the indices for the material are known. Much investigation requires to be done in order that more may be known about the values and variation of the indices for the important materials. Sufficient is given by way of example to show important practical applications of the proposed general expressions for creep in enabling both stress and creep distribution to be determined.

* * *

Welding in Collieries

A paper on the uses of electric arc welding in collieries was read at a meeting of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS at Cardiff on Saturday by Messrs. A. T. ROBERTSON and E. B. NIXEN. The authors maintained that hand arc welding plant was the most versatile tool ever made available for the colliery engineer. As there was no recognised specification for dynamic performance of welding generators, the most difficult problem before the purchaser was to decide on the type of plant. The choice of the correct electrode was of utmost importance and a bewildering range was available, but it could not be stressed too much that the type of electrode used played an important part in the welding to be done.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Cheap Electricity?

May I appeal to "Grid" to look a little wider. He focuses his vision on cheap electricity as the function of the grid: is it not rather ultimately the prosperity and welfare of the nation that matter? If cheap electricity is to be obtained by the process of forcing the coal-owners to sell at prices which will not allow adequate wages to be paid in their industry, who can say that the expansion in the use of electricity is a boon to the miners?

"Grid" is alarmed by the idea of coal marketing boards, forgetting the Central Electricity and other Boards. To me it has always passed comprehension that the coal-owners, with greater strength at their command than probably any other association of producers, have continued year after year to produce unprofitably, when they had at hand the remedy of raising coal prices at home, even if it meant additional Government protection to prevent the dumping of coal from foreign countries.

"Grid" also dislikes the idea of the price of domestic coal being subsidised by the price of coal to public utilities. Is not the same principle carried out in the sale of electricity where many a cut in the price to industrial firms has been paid for by the poor defenceless domestic consumer? There is hardly any other association of manufacturers in the country moreover that does not subsidise business in a difficult market from the prices obtained in a safe one.

After all, what does an increase of 3s. a ton in the pithead price of coal mean to the electrical consumer? At grid efficiency about .04d., a small fraction of a farthing per unit. If the coal industry can find amelioration for such an expense, there are few electrical consumers who will grudge the increase. WEOLEY.

November 19th.

All-electric Houses

Mr. C. P. Tufnell has asked for further information concerning my all-electric house, and I trust that the following particulars will meet his requirements:—

The family comprises three adults and the size of the rooms is 12 ft. by 13 ft. by 8 ft. 6 in. The north living room is equipped with a 3-kW "Insette" fire and the south living room with a 2-kW "Adjustalog" fire. Each bedroom has a 750-kW fire of the reflector type. With the foregoing loadings it is possible to meet all weather conditions, and it is very seldom that more than one element is necessary after the initial warming up of the rooms. The 2-kW immersion heater fitted to the 30-gal. bathroom tank is not thermostatically controlled but the cylinder has a heat-insulating jacket. Five or six baths per week are taken and there is no laundry work carried out at home.

I agree that there is a shortage of hot water from the bath tank after a considerable quantity has been drawn off, but small quantities of hot water are instantly available from a 1½-gal. storage heater in the kitchen which is always in circuit and controlled by a thermostat. W. SPENCER.

Worcester Park, Surrey, *November 22nd.*

Motor-car Voltages

My experience leaves me in no doubt that illumination of a car's headlamps is not so good at 6 V as at 12 V. Apart from the increased voltage drop in the wiring, the contact resistance in the lampholder limits the current that can pass without excessive drop at these points. Handlamps with a 6-V system are usually for 18 or 24 W, whereas with 3 A at 12 V the wattage can be 36, which is undoubtedly a great advantage on grey roads.

Moreover, on a cold morning a 12-V starter will produce more power in practice because of the lower voltage drop at the battery terminals. While the ampere-hour capacity of a 6-V battery for the same weight may be more, it is the watt-hour capacity that counts. As a 12-V battery has a greater reserve, it will stand up better to rough usage and should thus have a longer life.

The 6-V system has the advantage in price, however, and there seem to be signs of standardisation on that account, "baby" cars being fitted with 6-V and larger cars with 12-V equipment. H. C. C.

November 23rd.

Mr. E. R. Ford in your issue of November 15th champions the cause of 6-V lighting and starting for cars, but I cannot think that his views are generally accepted. To obtain the wattage for equal illumination at 6 V the current must be double that at 12 V. Consequently with the same size cables the voltage drop is double, and as this drop is a percentage of 6 V instead of 12 V the effective drop is four times. To obtain equal results the cables should be four times the sectional area for the lower voltage, and as this is not done the lighting suffers, and the same applies to the starter circuit.

It is stated that starters and generators are cheaper to manufacture and repair. I am surprised to hear this, but if it is so the difference must be very little. Batteries are stated to be of much greater capacity for the same weight, but obviously they should be of double the capacity.

I know of no motorist with experience of the two systems who would willingly have a car with 6-V lighting and starting, and many would rule out an otherwise satisfactory car on this count alone. C. W. G.

November 22nd.

Safety with A.C.

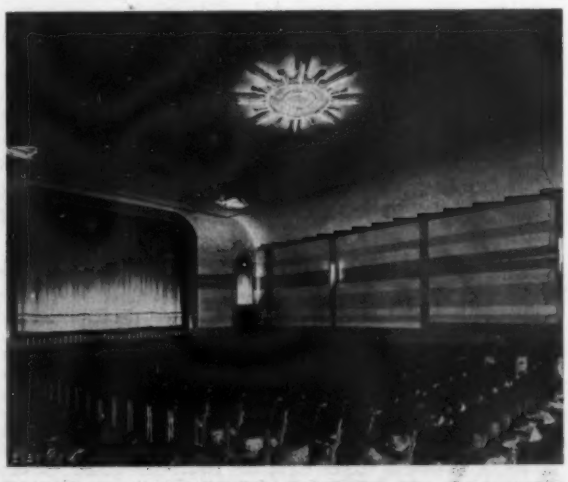
With reference to the leader in your journal of September 20th, my objection to the use of a.c. is confined to domestic purposes only and not to industrial and other uses which are under expert supervision. I fervently desire the unhurried and unfaltering progress of science with *safety and economy.*

The causes of death by electric shock have been discussed by me under type or system of circuit, voltage, time element, current strength, heavy current and burning, and resistance.

You say in your leader "such differences, however, cannot be held to account for the greater number of accidents with a.c. These are mainly due to its predominance and it could be shown that accidents at high voltages are no more common than those at low voltages, but this would be entirely misleading. One cannot handle either 230 V d.c. or 325 V (maximum) a.c. with impunity, a shock at less than 40 V having caused death."

But how many died at 230 V a.c. and how many at 40 V? What are the percentages of death at these voltages? Between 1911 and 1921 Mr. Scott Ram reported only six deaths from contact with 250 V d.c. or less (one from shock and five from burning) whereas during the same period he reported 150 cases of death from contact with 250 V a.c. or less—a period, when, in the main, alternating-current systems were in common use.

In the course of the last thirty-five years during which the Calcutta public have been using d.c. there have been scarcely any deaths due to 220 V d.c. (*Commercial Gazette*, 1935.) In the Benares Hindu University there has not been a single fatal accident during the last fifteen years at 220 V d.c., whereas in Benares city, which uses 230 V a.c., there have been more than two dozen cases of electrocution during a period of only six years. The State Inspector, Mr. R. Holmer, says "The disastrous effect of 220 V a.c. residential supply is seen from the following figures given below for Sweden where d.c. is supplied to 1.4 million consumers, a.c., about 110 V to earth, to 1.7 million, and a.c. 220 V to earth to 1.1 million. The total number of deaths up to 1931 is one with d.c., and 572 with a.c. During 1930, eight fatal accidents were caused by 220 V a.c. and one by 110 V a.c." These figures show that fatal accidents are practically nil when using d.c. and that high-pressure has caused twice as many fatal accidents as low-pressure a.c. and that fatal accidents at 220 V are about ten times those at 110 V.



A handsome theatre-lighting installation—the Hippodrome, Connah's Quay, Liverpool (G.E.C.)

For purely practical reasons electricity supply undertakings must obviously soon begin to realise the necessity of taking steps to reduce the number of fatal accidents as far as possible. Present experience on the Continent, therefore, clearly proves the necessity of introducing special protective devices in order to avoid dangerous voltages occurring between metal-covered appliances and earth (*e.g.*, in stables, cowsheds, and garages) or earthed conductive objects (*e.g.*, water pipes in bathrooms) where the higher voltage (220 a.c.) is used; and the desirability of maintaining d.c., particularly in the densely populated areas of large towns. This condition has been especially favoured during the past few years by the perfection of the mercury rectifier.

It may not generally be realised that no fewer than 104 electrical accidents were reported in Bengal during the last three years, of which twenty-six resulted in death. If we cannot save every creature having an abnormally weak heart who may be electrocuted at 40 V, let us do nothing that may injure the normal man who meets with sure death at 230 V a.c. The mischief by 230 V a.c. is, to my apprehension, palpable. I have done everything in my power to prevent it, but it is in no sense of pessimism that I have written.

As to statistics, I have drawn facts from the technical Press and from various tables and records, but the lists were never meant to be exhaustive. The simple state of the case seems to be this: At this period the science of electricity like other branches of science and other knowledge is just in its infancy. The conversion of d.c. networks to a.c. has yet to be proved as sound under different climates and conditions.

Incidentally, *Science and Culture* is a Calcutta paper and not a "Bombay publication."

Benares, *October 26th.* B. C. CHATTERJEE.

The Value of Qualifications

The I.E.E. was founded to give electrical engineers a professional qualification, as the Inst.C.E. was concerned mainly with buildings and roads. Should members of the I.E.E. have to get other qualifications to enable them to exercise their talents? Could not the I.E.E. introduce constructional questions into its examination papers, varying them to suit each section?

I find that my degrees have so far been useless (and perhaps a hindrance) to me, but they now place me in a position to apply for a better post. Not that this seems to matter much, for when I see a prospective employer, after commenting favourably on my training and experience, he asks me why I wish to leave my present post. On being told that three years ago I had to take the first position open and that the one he offers promises better prospects and is more suitable to my training, he implies that to have my present position I must be a dud and so I am passed over.

November. 23rd. AGED FORTY-THREE.

Emergency Greenhouse Heating

Your readers may be interested to know of our experience during the heavy rainfall of the week-end November 16th to 18th.

On Sunday morning the boiler pit of our propagating house (50 ft. by 12 ft.) became flooded. Baling operations were carried out all day, but in the evening it became obvious that these would have to be continued all night in order to keep the water away from the boiler fire.

The greenhouse is divided into two parts. Into one of these we moved all the plants which require a night temperature of from 55 to 60 deg. F. These were chiefly tomato seedlings. We quickly connected up an electric heater and thermostat, setting the latter at 60 deg. F., and then left the house to look after itself for the night. Next morning the fire box of the boiler was completely submerged under water, the electric heaters were on, and the greenhouse temperature was 58 deg. F. H. CHURCH & Co. (ESSEX), LTD.

Witham, Essex, *November 20th.* H. CHURCH.

Unity in Selling

From time to time recently, in various sections of the electrical Press, articles and letters have appeared which show that the commercial side of electrical distribution is in a chaotic state. To those of us employed in this work it has been painfully obvious for some years. There are two main causes of the trouble: one is the absence of rationalisation, the other the absence of organisation amongst employés on this side of the industry.

On the one hand we have committees or boards of directors, largely influenced by the manager or chief engineer, anxious to keep down costs in a market where, to a certain extent, the business has been obtained without any great effort. On the other hand, we have a large number of potential employés, of varying grades of ability or experience, used as a lever to compel the acceptance of ridiculous salaries. That this is a very short-sighted policy is shown by the fact that the very people who are called upon to further the use of electricity are, in nine cases out of ten, placed in a financial position which makes the purchase and use of electrical appliances an impossibility.

It is possible that, with the concentration of attention on generation and technical distribution, the commercial side has not received the attention it deserves; but surely the final disposal of an article is as much the duty of a manager as its manufacture and distribution.

It is the duty of those in an executive position to attend to this market right at their doors, and of the employés to get together and see that they are no longer penalised by the employment of poorly paid, inefficient or inexperienced competitors. DEVELOPMENT.

November 23rd.

A Refrigeration Section Proposed

May I say a few words on behalf of the much neglected refrigeration industry which is now making such rapid strides forward in both the commercial and household worlds? There being at present no Refrigeration Institute, I think the time is now ripe for either the Electrical or Mechanical Institutions to form a separate Refrigeration Section, in which papers could be read, progressive designs discussed, and regulations formulated.

As an engineer who has access to and frequently inspects many different makes of small automatic plant, I think that an up-to-date set of regulations would be of great assistance to those installing new plant and would also tend to make those agents fall into line who are apt to employ unskilled labour and slip-shod methods.

While it is probably true that the great majority of reputable manufacturers have their machines installed efficiently, one still finds plant, especially in the country districts which have just been "dumped" on site, connected to the supply by two-pin plugs, there often being no separate fuses in circuit and no earth wires attached, standing in dairies, or butchers' slaughter-houses, where wet concrete floors are the rule rather than the exception, and where one is certain to receive a nasty shock should a fault develop on the circuit at any time.

Water cooled plant is installed where there is a shortage of water and air-cooled plant is situated in unventilated cellars, or tucked away under benches up against walls where ventilation is practically impossible. Other refrigerators are mounted in very accessible positions without any means of protection whatsoever, where articles drop off surrounding counters into the mechanism, or coats and aprons are caught in between belt and flywheel when one passes. Lastly, cold chambers are still installed with no inside handle, so that exit is impossible should the door be accidentally closed with somebody inside.

I should be interested to hear the opinion of other readers on this subject. C. H. EDWARDS, A.M.I.E.E.

Seven Kings, *November 25th.*

Differentiation between Consumers

IN the Chancery Division on Tuesday Mr. Justice Eve had before him a motion for judgment brought by the Attorney-General at the relation of the Eastbourne Gas Co. against the Eastbourne Corporation in default of defence. The plaintiffs alleged that the Corporation had offered to supply consumers with electricity at cheaper rates if they would undertake not to use gas for cooking and heating.

Mr. Uthwatt said he moved for judgment in the case. The plaintiffs alleged that the defendants had committed a breach of Sections 18, 19 and 20 of the Electricity Act, 1882, which provided for uniform rates to consumers and prohibited any undue preference. The complaint of the plaintiffs was that the Corporation Electricity Department had issued a circular in which it offered lower rates for electricity under certain circumstances and differentiated between consumers who used gas and those who did not.

The plaintiffs asked for a declaration that the differentiation made or offered by the Corporation to those who desired an "all-in" tariff and used electricity for cooking or water heating, between consumers who used coal or coke for lighting, heating, cooking or water heating, and consumers who employed other means, was a contravention of the Act. The plaintiffs also sought a perpetual injunction restraining the Corporation from making such differentiation.

Mr. Byrne, for the Corporation, said that the declaration asked for seemed to be in the right form.

Mr. Uthwatt said that the Corporation had given the plaintiffs an assurance that it would withdraw the circular and issue a new one. Plaintiffs under these circumstances asked for liberty to apply for the injunction. Mr. Byrne said he was instructed that the Corporation had already withdrawn the circular complained of and a new one had been sent out.

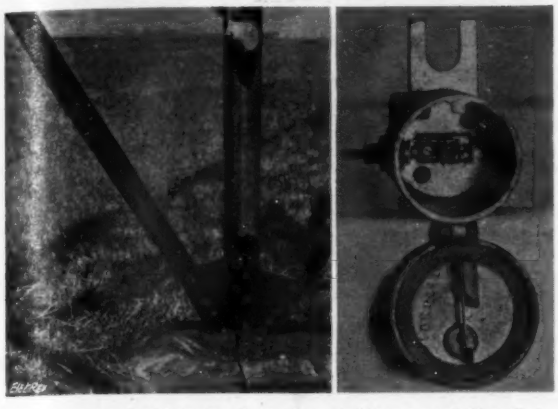
In the result his Lordship granted the declaration as asked, and gave the plaintiffs their costs with liberty to apply.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

The "Warren" Fault Locator

The "Warren" fault locator offered by MESSRS. A. REYROLLE & CO., LTD., Hebburn-on-Tyne, for application to overhead lines of almost any type and voltage, a.c. or d.c., is operated by the potential difference which is caused by the passage of



A fault locator fitted to the foot of a steel tower and (inset) a "close-up" of the locator

fault-current to earth through the metal towers or wood poles in the immediate vicinity of a fault. This is utilised to send a current through a fuse consisting of a luminous indicator, which has one terminal connected to the tower structure (or to the downcoming earth-wire of a pole) and the other to an auxiliary earthing spike driven into the ground. In a circuit with an earth wire the fault-current flowing to earth is greatest at the towers or poles in the neighbourhood of the fault, and decreases rapidly with increasing distance from the fault. Consequently, the design has to be such that the current through the locators situated near the fault is sufficient to cause their operation while the remaining locators are left intact. Where the circuit is without an earth wire, only the locator mounted on the faulty pole is affected.

The apparatus is readily examined at ground level after each fault by applying a test battery across each in turn; failure to indicate shows that the fault has occurred at or at least very close to the tower or pole under test.

The locator is accommodated in a small cast-iron box fitted with a weatherproof hinged lid having a spring catch and provided with a special key to prevent unauthorised interference. An adaptor-plate is fitted to the box to enable it to be mounted directly on steel towers.

Special attention is paid to the method of connecting the wire to the earthing spike. The terminal is coated with bitumastic paint to prevent corrosion where the copper and the steel come into contact, and in addition the wire is clipped to the top of the spike just above the terminal in order to take up any pull at this point during erection.

Bakelite Lampholders

Samples of three new types of lampholder have been sent to us, one of them—the "Falkland"—made by ASHLEY ACCESSORIES, LTD., Finch Place, Falkland Street, London Road, Liverpool, is moulded entirely in bakelite. The other two, one of which is a product of the same concern, and the other of LIGHTING TRADES, LTD., 17, Farringdon Road, London, E.C.1, have porcelain interiors. The accompanying illustration shows the different cord grips employed. One-piece brass plungers and brass liners are used in all the holders.

The new Ashley lampholders and (right) a Lighting Trades holder

The "Snaplite"

We understand from the BURGESS PRODUCTS COMPANY, Barwell, Leicester, that its small "Snaplite" flashlamp has been modified so as to enable a cheaper and more widely obtainable type of battery to be used. The cover, which normally protects the bulb when the lamp is not in use, acts at other times as a shade; thus, the "Snaplite" is particularly suitable for use in theatres and cinemas to enable the programme to be read with ease.

A High-speed Grinder

A portable high-speed grinder known as the "De-luxe Hand-ee" has been introduced into this country by MESSRS. G. E. MARBAIX, LTD., Vincent House, Vincent Square, London, S.W.1, who are agents for the Chicago Wheel & Manufacturing Company. Weighing only fifteen ounces, it has a speed of 25,000 r.p.m. and can be used for a large number of purposes such as grinding, drilling, polishing, cutting, sanding, sawing and engraving. It is 6 in. long overall and 1¼ in. in diameter. A housing with no projections is achieved by the use of a new type of radial commutator and patented S-type built-in switch with sliding contacts. The radial fan mounting keeps the running temperature low. As is shown in the accompanying illustration, the grinder is designed so that it can be held like a pencil. Aluminiated duralumin is employed in the body of the tool, while the moulded bakelite parts are used as bearing retainers and for the end caps.

The "De-luxe Hand-ee" grinder

Bell Transformers

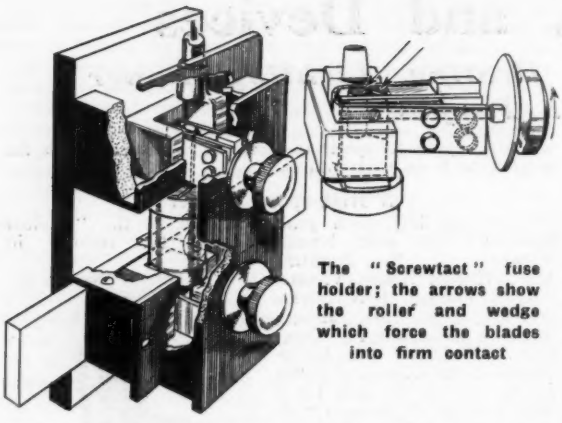
Ironclad transformers fused on both the primary and secondary circuits, and thereby complying with the I.E.E. Regulations, are being made by MESSRS. JULIUS SAX & CO., 27, Lower Mall, Hammersmith, London, W.6. They have soft grey iron castings and high-quality transformer-steel insulated laminated cores. Primary and secondary windings are insulated from each other, and an earth shield is provided. The fuses are mounted on a substantial insulated base with easy-wiring terminals, each tapping being fused. The iron case is tapped for ¾-in. conduit entry for both primary and secondary terminals, and insulating bushes are provided.

An Engine Tester

MESSRS. GERALD STAINS, LTD., 12, Underwood Street, City Road, London, N.1, have recently introduced a light, portable equipment, known as the "Nubo" engine tester, which provides a means of locating electrical troubles in motor vehicles without dismantling the engine. The tester comprises a strong bakelite box with an earth wire and twelve 2-ft. high-tension wires held together in pairs, so that six cylinders can be coupled up simultaneously for testing. Six sliding keys fitted with spark points are provided, and there are a similar number of fixed spark points on the panel of the tester. When the tests are being carried out the engine is allowed to run normally, the plug gaps being tested and compared by drawing out the sliding keys until the current alternates between the earth bar and sparking point.

A Cartridge-fuse Holder

A holder for English Electric high rupturing capacity cartridge fuses (60 A and 25,000 kVA) or for other types to special order has been produced by the DONOVAN ELECTRICAL CO., LTD., 46-47, Great Charles Street, Birmingham, 3. The one operation of tightening two self-locking insulated screwed handles in the insulated bridge firmly clamps all connections from the bus-bar to the cartridge and no tools are needed. The solid tabs of the cartridge and of the solid base block are forced together under a pressure given as 2,000 lb. per sq. in., due to the action of a wedge in each bridge contact. If cable is taken from one end, the cartridge tongue is pressed down on the cable socket. The absence of spring in the contacts prevents their deterioration through heating. The cartridge is

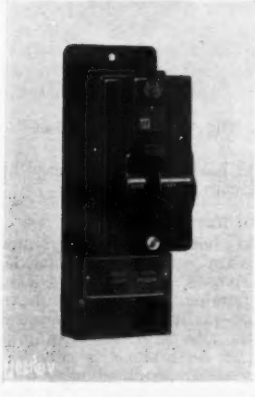


The "Screwtact" fuse holder; the arrows show the roller and wedge which force the blades into firm contact

renewable in about five seconds as it is merely clipped to the bridge, which can be inserted or withdrawn quickly owing to the small amount of screwing or unscrewing necessary.

Miniature Breakers with Earth-leakage Trip

The Statter type "MCB" miniature circuit-breaker, rated at 250 V d.c. or 500 V a.c., can, so we are informed by MESSRS. J. G. STATTER & CO., LTD., 16, Great George Street, London, S.W.1, be obtained with an earth-leakage trip to conform with the latest I.E.E. Regulations, *i.e.*, operating at a current not exceeding 30 mA with an earth resistance of one ohm. The single-pole type can be fitted with a thermal overload trip.



The d.p. breaker with an earth leakage trip

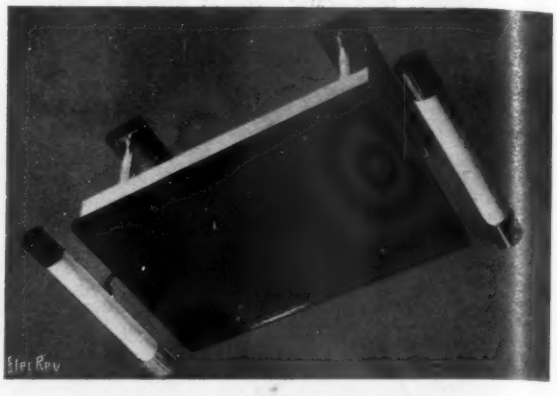
A test button is fitted which, when depressed, connects the earth-leakage coil to the phase wire, through a high resistance, thus producing an artificial leakage fault which trips the breakers.

Combined Lighting and Heating

Combined lighting and heating panels for fixing to the ceiling have been introduced to this country by SPACE HEATING, LTD., 46, Park Square, Leeds, 1. The units are rectangular in shape, a 60-W tubular lamp being arranged at either end, while the fact that they are fixed to the ceiling makes them very suitable for use in bathrooms. The standard finish is a black vitreous enamelled front plate, a cream back box, chromium-plated supporting rods and lampholders and polished black pattresses.

The front plates may be vitreous enamelled in almost any colour, and the back box can be supplied in about twenty different colours, while an alternative finish for the metalwork is brushed oxidised copper. Adequate heat insulation is obtained by the double back box construction, combined with spun glass packing. These panels are being used for the heating of the Exeter Corporation showrooms.

Our illustration shows the vitreous enamelled front plate as having a turned-up edge; we understand that the units are



The "Lightfoot" combined heating and lighting unit

now being supplied with the front plate reversed, the turned-up edge being on the top side and therefore invisible. The 18- by 12-in. panel loaded to 900 W weighs 25 lb.

Heating Car Radiators

The electric heater for cars made by DESMO, LTD., Desmo House, Stafford Street, Birmingham, 4, is loaded at approximately 40 W and gives about twice as much heat as a paraffin lamp. The cable is fitted with a two-way adaptor, enabling the heater to be operated from the lighting circuit when the garage lamp is in use. It is one of the few heaters of this type to have an earthing clip.

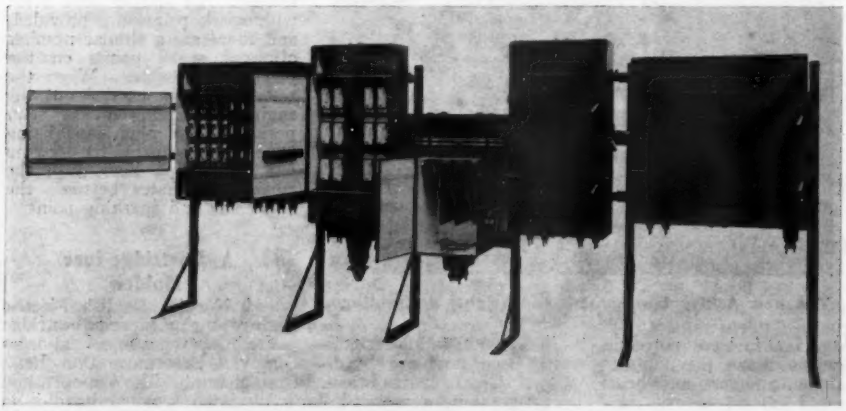
The radiator heater

A Half-wave Rectifier Valve

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, announces the introduction of a new half-wave rectifier (the U.16) specially designed for use with cathode ray tubes. It is capable of withstanding an anode voltage of 5,000 and the maximum rectified current is 2 mA. It is of sturdy construction and the anode is in the form of a circular plate with a connection to the top of the bulb. The filament rating is 0.25 A at 2 V.

High Rupturing Capacity Fuse-gear

AT a recent exhibition of the English Electric Co.'s high rupturing capacity fuse-gear held in London we had an opportunity of inspecting a new type of fused distribution board and the "U.35" universal fuse unit. The former is noteworthy principally because a cable chamber is provided at each end so that both incoming and outgoing cables can be brought in at the top or bottom. Alternatively, the incoming cables may enter at the side.



One of several new English Electric fused distribution boards supplied for a large steelworks extension scheme. It is built up on a floor and wall fixing framework with incoming isolation switches and bus-bar chamber. On the right are two boards coupled by means of a short trunking

This type of board is obviously very suitable for use on a ring main entering or leaving at the top or bottom. In addition to feeding distribution boards, tapping may be made to other gear through the opening in the side of the box, in this particular instance by means of a bus-bar chamber. Long cable tails are unnecessary, the outgoing contacts being connected to paxolin-covered copper rods which terminate at each end in a clamp type sweating socket after passing through an insulating spreader. Liberal clearances and ample space are left for cabling, and a push-off spring ensures that the door opens if it is not definitely fastened. A wedge-shaped handle on the door helps to keep out dust and moisture.

The "U.35" fuse wall-mounting unit is designed to give maximum cabling facilities and is intended primarily for sub-station work where space is a consideration. It can be supplied for any circuit arrangement and is at present available in 300-, 500- and 800-A ratings.

Electricity Supply Finance

Sir Robert Renwick's address to the Batti-Wallahs

THE principal guest at the luncheon of the Batti-Wallahs' Society held at the Hotel Metropole on November 21st was Sir Robert Renwick, Bt., vice-chairman of the County of London Electric Supply Co., Ltd., and a director of other electricity supply companies, who gave an interesting address on "Some Aspects of Electricity Supply Finance," in the course of which he referred to the growth of the industry in the past few years. He said that the capital invested had increased from £132,118,403 in 1920 to £390,865,356, and the sale of electricity from 3,500 million kWh to 11,500 thousand million, an increase of 225 per cent., while for domestic purposes alone the increase was nearly seven times.

On the other hand the average price of electricity for all purposes had fallen for the same period by over 49 per cent., and for domestic purposes alone by over 60 per cent. Yet the man in the street was firmly convinced that the industry was mis-managed. The main reason why it was so criticised was because from its birth it had been the centre of local politics. In this atmosphere many fallacies had sprung up.

The public was usually given the consumption per head of population in countries like Norway, Switzerland and Sweden, as compared with similar figures for this country, but they were not usually given the figures for France, Italy, Holland and other countries, where, comparing the figures with Great Britain, we headed the list. It was seldom pointed out that the countries cited, whilst having enormous sources of water power, had little or no coal, and therefore no gas competition. For the domestic consumption per inhabitant, Great Britain stood third in the list of all the countries in Europe, plus the United States, but it headed the list, including America, for the domestic sales per consumer, and this in spite of gas competition.

The management of the supply industry had to encourage the demand by attractive tariffs, but watching carefully to see that the ever-decreasing price received was adequate to take care of the extra capital expenditure constantly required. The spirit of the supply industry could be ruined by any undue interference or by the limiting of its inherent desire to work out its own salvation. Hundreds of millions of money would have to be raised before it had reached anything like saturation point.

The Pioneers

The companies were the pioneers of the industry both with regard to "super power stations" and high-pressure distribution. In the early days shareholders waited twenty years or so and received little or no income from their investments. But to-day the companies could raise their money on as good terms as local authorities although there was no security of the rates behind them.

The development of rural electrification during the last ten years had made available supplies of electricity to about 99 per cent. of the population of the country, and that achievement was materially due to private enterprise. Sir Robert gave two instances of what private enterprise had done for the industry. The Barking power station, he said, was erected in spite of the opposition of practically the whole of the electricity undertakings in London; that opposition was so strong that for some years it was impossible to get the necessary finance. Ultimately this had to be raised by the issue of one-year notes, which were subsequently replaced on an 8 per cent. basis. Although it was laid down that power plant should last from twenty to twenty-five years and be written off over that time, the first section of Barking, as compared with the last section, might well be termed out of date in the short period of ten years, owing to the great strides made by science.

The other example was the laying of h.p. cables to convey the energy away from Barking. Two million pounds was spent on 33,000-V cables, which had to be heavily re-inforced by further capital expenditure, owing to the reduction of the pressure and carrying capacity of the original cables after a few years' life of the cables instead of the official forty years. The cable manufacturers stood up to their obligations, and although it was a costly business for all concerned, it taught the whole industry a lesson from which it benefited to-day.

There was a tendency to say that a 3 per cent. depreciation of electricity supply assets was adequate. This was the very minimum, and he thought the next few years would show that we must revise our views. The formation of the Central Electricity Board had brought about a revolution in the industry. A member of the Board had stated that its advent had already effected a saving of twenty million pounds a year.

This, however, was not the whole picture, particularly as the statisticians at once compared that reduction with the tendency there was for the cost of distribution to increase. The sum allocated for generation did not include the great amount of plant which had been rendered redundant by those undertakings which had scrapped efficient plant so as to take the grid supply. Those amounts had to be written off, and the sums at which they stood in the books to-day should properly be added to the total figure for generation. Sir Robert instanced a company which spent £75,000 on boiler and other plant in 1928, which it sold as scrap for £4,000 recently.

The advent of the Board and the super power stations had brought about a revolution in h.p. distribution with the result that the distributor found that what he considered adequate switchgear was no longer sufficient, and that the whole of his system had now to be strengthened. This was clearly emphasised by the anxiety being felt to-day by the whole industry with reference to switchgear, which might mean the expenditure of hundreds of thousands of pounds and the scrapping of gear wholesale without necessarily selling a single extra unit.

What are Generating Costs?

This extra charge on the industry, due entirely to improved generation and h.p. distribution, should therefore be added rather to the cost of generation than distribution. The remote sub-station of to-day was but a distant bus-bar of the super generating station, and economies in capital expenditure on generation must increase expenditure on transmission, and the expansion of transmission would tend to maintain, rather than reduce, repairs and maintenance charges on distribution.

The considerably increased expenditure on distribution had been accompanied by expansion of the service rendered to consumers; the provision of current-consuming devices for the home, and the service this entailed had necessitated substantially increased staff, and, in the rural areas, in order to render effective service, the provision and maintenance of transport had materially increased distribution costs.

So long as the industry kept financially healthy and so long as the companies were allowed to build up a pool into which they could dip when unforeseen obsolescence occurred, so long would progress continue.

The retail side of the industry required the most intimate form of salesmanship. It was its business to educate the public, and the only way was to study the various types and classes offering to each a tariff that would appeal to their intelligence and their needs, and be within the capability of the distribution system giving that supply. He deprecated the craze for uniformity of tariffs. Perhaps in fifty years' time, when a comparative saturation point was in sight, then an ideal uniform domestic tariff might become practicable.

Not a National Problem

The industry was so large and so diverse that it was impossible for the Electricity Commissioners to keep in intimate contact with the everyday running needs of the industry. Distribution was not a national problem. In those parts of the country where it was a problem at all, it was definitely a local or district problem, and, as such, the Commissioners should take a hand in its solution.

He would like to see in districts where it was found necessary, each corporation and each company in the area forming an alliance for mutual co-operation; the alliance could agree as to what the future development of the area should be from the technical point of view, as to uniformity of charging and as to uniformity of pressure. He would like to see any matters in dispute settled by the Commissioners.

The big corporations and companies in each alliance would probably agree to bulk purchasing for the whole alliance, thus greatly helping the smaller members. Joint schemes for strengthening the distribution of the area as a whole would be entered into, members allowing the power company to run its mains through their areas. Fringe Orders could be amicably arranged. This would cause little or no disturbance in the industry, or to the investor. Members of the alliance would all have local knowledge and would be the ideal men to run the system. They would give their services without charge, so that the overheads would be a minimum, the industry merely having to meet the salaries of extra Commissioners and alliance secretaries.

He would also like to see the Commissioners give notice that when the renewal date of an Order fell due in respect of an isolated undertaking they did not intend to renew it; that the undertaking must be sold, not to the local authority but to the power company for the area or a neighbouring big corporation. If this policy were laid down small undertakings would sell out long before the end of their tenure, and within ten years the whole position would be cleared up.

A third course to be taken was to forbid unauthorised undertakers to control authorised undertakings, unless they were prepared to let the Commissioners' auditors inspect their books.

If these steps were taken, the industry would be ruled with a firm hand by Commissioners who, through the large corporations, companies and alliances, would be in intimate touch with the direction of the industry, which, in turn, would still be managed by the same pushing private enterprise and the same able corporation officials as it was to-day, but instead of all working on their own they would work together for the good of each other.

Before long, he believed, small corporations would be willing to hand over their management to the big corporations and companies if they felt that their consumers would benefit. Thus, kept free of all forms of politics, ruled and guided by a strong hand, "this young colt would grow into a smashing horse—a veritable winner."

Speeches at the B.E.A.M.A. Dinner

The Chairman of the Distribution Committee as chief guest

LORD DERBY, the president of the British Electrical and Allied Manufacturers' Association, presided at the annual dinner of the Association which was held at the Connaught Rooms, London, on Thursday last week when over 800 people were present. The principal speaker was Sir Harry McGowan, chairman of the Imperial Chemical Industries, Ltd., and of the Ministry of Transport Committee on the Distribution of Electricity.

Since the last dinner Mr. D. N. Dunlop, for many years director of the B.E.A.M.A., has passed away, and Lord Derby paid a brief tribute to his work, while the assembly stood in silence.

Sir Harry McGowan proposed the toast of "The Electrical Industry" and in the course of his speech made reference to the rapid progress of the industry during the past few years. He said that although the *Economist* index of business activity showed an increase of only 13 per cent. over 1924, since that year the output of electricity had increased by no less than 179 per cent. He characterised the grid as a remarkable example of technical, financial and commercial co-operation on a national scale. No single entity could claim credit for this achievement; it was due to those responsible for the production of the complex plant required; the power companies which had done so much to lower the cost of power generation; and the Government for its action.

Striking as the present achievement was much more remained to be done—particularly in the home and on the railways. The electrical industry was a happy one in that it could still contemplate a great future.

Pointing out that the prosperity of the industry was bound up with that of the country as a whole, Sir Harry made no apology for referring to the question of the "distressed areas." He considered that the measures taken so far were totally inadequate. A closer study of the problem should be made by men intimate with the districts concerned and the Government should consider the setting up of a large industrial finance company for each area, working with substantial resources raised publicly with a Government guarantee. It was also worth considering whether the Government should not make an actual cash contribution limited to a certain percentage of the total capital expended on plant, machinery and other fixed assets of new industries established in the areas.

Manufacturers and the Central Board

Responding to the toast Mr. V. Z. de Ferranti, Member of the Council, mentioned that the electrical industry now employed 340,000 people and represented an investment of £600 millions. The B.E.A.M.A. grew out of the adversities of the early part of this century caused by insane cut-throat competition largely fostered by purchasers. The large gathering at the dinner was a living demonstration that those times were over. The manufacturers were willing to help other sections of the industry and as an example of the extent to which manufacturers were prepared to co-operate with each other, he declared that he was deputising for a distinguished colleague so that the latter might go and get an order.

He recalled that it was only fifty years ago that his father changed over the series system at the Grosvenor Gallery to parallel running, a step which had had far-reaching results. Invention and new ideas should be given every encouragement and assistance.

It had been said that the Central Board was not a charitable institution and yet in one respect it was similar. Charitable organisations received many gifts; the Central Board had had contributions from many manufacturers but it had certainly used them wisely and well.

Referring to the help received by British manufacturers from the Dominions, Mr. Ferranti said that New Zealand had encouraged them to construct 110-kV plant fifteen years ago before anything of the kind had been attempted in this country and the experience had proved of great advantage. South Africa had also been a very good customer.

Railway electrification, which had been systematically pursued by the Southern Railway, opened up a wide field for the help and convenience of the public. Electrification meant increased traffic and he hoped that the railways would seriously consider the conversion of their systems in industrial areas. In the direction of communication electricity had rendered possible world-wide linking up which would have far-reaching results. Radio sets had added 200,000 kW to the mains and had been a means of introducing a vast new army of consumers to the industry.

Dealing with the depressed areas, the speaker said that it was possible to be poor without being depressed. If the surroundings were improved the people's outlook would be entirely altered. The burning of raw coal would have to be prohibited and electricity used in its place. He thought that this would come about in the fairly near future.

Buyers and Sellers

Lt.-Col. R. K. Morcom, C.B.E., proposed the health of the guests. He said that people had been brought up on the motto "*Caveat emptor*," but his advice was "*Caveat vendor*," for the buyer needed careful watching. An Association with a strong selling policy was of the greatest benefit to humanity. Among the guests were representatives of Government buying departments from whom the industry expected good orders in the near future. There were also representatives of the Tariff Board, of whom the industry entertained great hopes. They also welcomed the scientists present, although their discoveries had often led manufacturers into great expense. The presence of a large number of railwaymen encouraged him to hope that "a marriage had been arranged." Referring to Sir Harold Hartley, whose name was coupled with the toast, Col. Morcom said that he was interested in gas. The gas industry bought much machinery from electrical manufacturers and the latter, in turn, purchased much coke. Many a gas engineer had electric light in his home and many an electrical engineer revelled in his gas cooker.

In the course of his reply Sir Harold Hartley paid a tribute to the late Mr. D. N. Dunlop for his work in connection with the World Power Conference which had done much to promote international understanding.

Mr. J. A. Hirst, Chairman of the Association, proposed the health of the chairman, and Lord Derby then made a brief response.

During the evening members of the band of the Coldstream Guards rendered a programme of music.

An excellent array of lighting fittings at the Knightsbridge premises of Messrs. Troughton & Young **(See page 757)**

Cardiff Engineering Exhibition

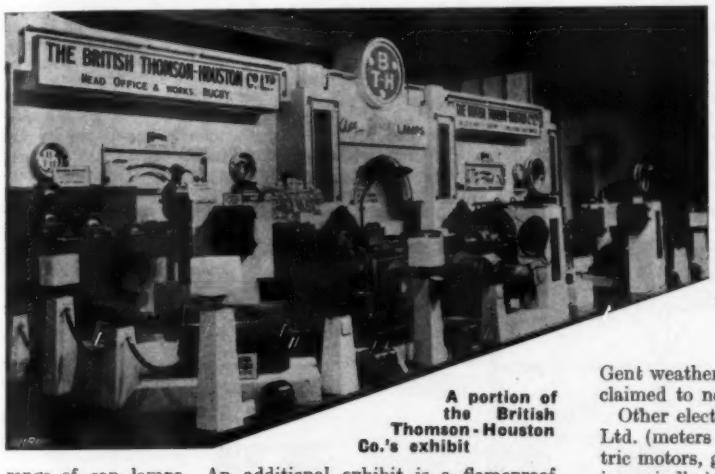
The increasing use of electricity in mines

THE annual exhibition organised by the South Wales Institute of Engineers, which was opened on November 20th at the Greyfriars Hall, Cardiff, is becoming more and more an exhibition of electrical devices, and no fewer than 75 per cent. of the stands showed devices dependent upon electricity for their operation. The exhibition remains open until to-morrow (Saturday).

The fact that electrical machinery is now being purchased increasingly for use in collieries is brought home forcibly by the small amount of pneumatic mining machinery exhibited. A section of a coal-mine roadway equipped as an actual road would be is attracting much attention, and both electric and compressed-air haulages and coal-cutting machinery are shown in use. This exhibit also indicates how electric lighting is used in colliery main roads supplemented by electric hand lamps, which, incidentally, together with lamp room equipment such as charging stands, magnetic openers, and the like, are the sole exhibits on at least six stands.

Over 200,000 of the Concordia Electric Safety Lamp Co.'s type "K.G." schedule "A" lamp are now in daily use, and this company is also showing an approved type dry-battery torch, officials' lamps of all kinds, complete lamp-room equipment, and a large "Paddy Lamp" for use where a greater degree of illumination is required for carrying out shaft repairs and other special underground work.

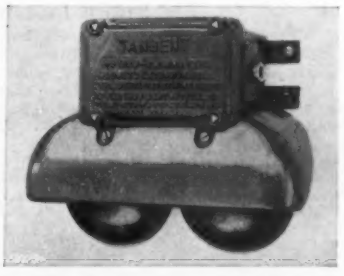
Batteries, Ltd., are displaying a complete range of miners' electric lamps incorporating "Nife" nickel-cadmium alkaline accumulators fitted with electrolyte level indicators which facilitate topping up. These accumulators are also used for a range of cap lamps. An additional exhibit is a flameproof emergency lighting set for the colliery winding-room and similar positions. The 4-V hand lamp type 4 made by Ceag, Ltd., is claimed to be the only hand lamp giving 1.96 lumens per lb. weight, these being Mines Department figures after nine hours' burning. The Wolf Safety Lamp Co. is featuring a new "Airturbo" in which electrical illumination is obtained from the compressed air supply. The air-driven dynamo incorporated in the appliance gives a 50-c.p. light with an air consumption of only 4 cu. ft. per minute.



A portion of the British Thomson-Houston Co.'s exhibit

A wide range of mining electrical equipment for surface and underground use is shown by the British Thomson-Houston Co., Ltd. Various types of electric motor, both flame-proof and otherwise, are to be seen, together with a new type of 660-V metal-enclosed switchgear for duty where flame-proof enclosure is not required, and also equipment for controlling two stations where space is limited. A large "No-Lag" power factor correction motor is shown in operation with a type "ATP" control pillar. Photo-electric relay apparatus, industrial heating equipment, "Fabroil" (non-metallic) gears and pinions, geared motors, and "Mazda" lamps and light tubes are other B.T.H. products.

On the stand of the Metropolitan-Vickers Electrical Co., Ltd., is a typical layout of apparatus suitable for intensive machine mining. On the h.p. side is a type "SF1" flame-proof switch of the company's latest mining draw-out pattern, fitted with visible earth leakage protection and other novel features. The supply is then taken through a 60-kVA flame-proof transformer on the l.p. side of which is a two-panel type "MU" flame-proof gate-end board. A flame-proof haulage motor of the sleeve-bearing type is shown, together with control gear consisting of a liquid controller, reversing switch, and combined master switch and control lever. A demonstration of a high-frequency arc welder is being presented and typical examples of colliery repair work are carried out. Further exhibits comprise flame-proof lighting transformers of various types for underground use, a Lilly overwind protection unit, meter-testing equipment, a portable sound-measuring set, an evacuating pump of very low vapour pressure, and a portable crack-detection apparatus, together with a large range of "Cosmos" lamps.

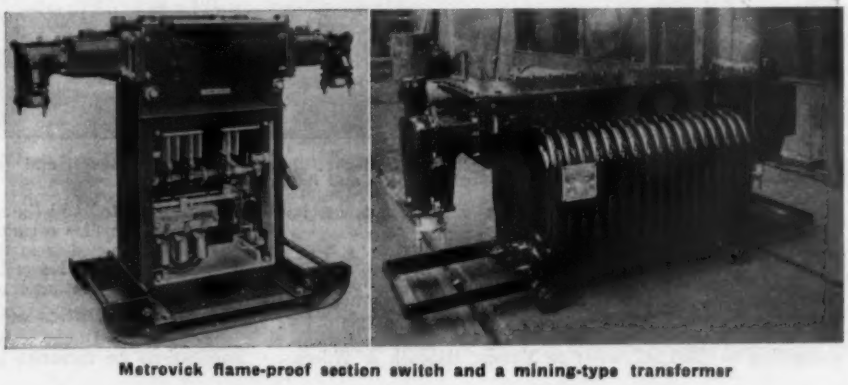


"Tangent" magneto telephone extension bell

Messrs. Gent & Co., Ltd., have a comprehensive range of "Tangent" certified mining bells, relays, telephones, signalling keys and pushes, electro-motor syrens, and a number of examples of industrial and domestic synchronous and "Pul-Syn-Etic" electric clocks. Other exhibits are an electric staff locator and an electric tell-tale clock which indicates a watchman's movements during the time he is on duty.

A new welding electrode manufactured by Philips Industrial is claimed to give higher welding speed, greater efficiency and increased elongation. Regular users of these electrodes are entitled to have specimen welds X-ray tested free of charge. A range of Philips battery chargers, cinematograph equipment, and a portable "Philivox" public address amplifier and speaker which can be operated from an ordinary 6-V car accumulator are other interesting exhibits. An "Auto-bus" installation enables drivers to make announcements to their passengers, while a similar arrangement enables deaf drivers to hear motor-horns. Gent weather-proof photo-electric cell and counting devices are claimed to need no attention for many years.

Other electrical exhibits of interest are shown by Ferranti, Ltd. (meters and measuring devices); Higgs Motors, Ltd. (electric motors, geared motors, totally enclosed polishing and buffing spindles); A. Reyrolle & Co., Ltd. (flame-proof switchgear, transformers, welding sets, the last mentioned in both single and five-operator installations); Simplex Electric Co., Ltd. (flame-proof lighting equipment and fittings, connection boxes, switches, steel conduit and fittings for underground use, and watertight fittings); Oldham & Son, Ltd. (hand lamps, automatic gas detectors and measuring devices, equipment for servicing lamps and accumulators, batteries, &c.); Tecalemit, Ltd. (lubricating equipment and accessories); British Oxygen Co., Ltd. (oxygen cutting machines, oxy-acetylene welding and cutting equipment, &c.); South Wales Electric Power Co. (information bureau); British Electrical Repairs, Ltd. (samples of work); Laurence, Scott & Electromotors, Ltd. (motors and control gear); International Combustion, Ltd. (electrically vibrated screen, stokers, &c.); E.M.B. Co., Ltd. (flame-proof controllers and resistances); and Ensign Lamps, Ltd. (traction lamps, &c.).



Metrovick flame-proof section switch and a mining-type transformer

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The British Industries Fair

Although, as usual, most of the electrical exhibitors are showing at the Castle Bromwich Section of the British Industries Fair to be held next February, there will be many items of electrical interest at the London Sections at Olympia and the White City, the following manufacturers being among the standholders:—

Aladdin Industries, Ltd.
Attracta Electrical Co.
Bakelite, Ltd.
Beetle Products Co., Ltd.
Belgrave Elec. Co., Ltd.
British Plastics Federation, Ltd.
British Rototherm Co., Ltd.
British Xylonite Co., Ltd.
Cables & Wireless, Ltd.
Cole, E. K., Ltd.
De la Rue, Thomas, & Co., Ltd.
Dernier & Hamlyn, Ltd.
Eastick, J. J., & Sons.
Ebonestos Insulators, Ltd.
General Mouldings Co., Ltd.
Gerrard Clocks, Ltd.
Hanovia, Ltd.
Heayberd, F. C., & Co.
Ideal Home Elecl. Appliances, Ltd.
Imperial Chemical Industries, Ltd.
Insulators, Ltd.
Kent Mouldings.
K.F.M. Engineering Co., Ltd.
Knightshades, Ltd.
Lusty, W., & Sons, Ltd.
Mayfair Shades, Ltd.
Moore's Mouldings Co.
Mouldrite, Ltd.
Phœnix Telephone & Elec. Works, Ltd.
Radio Development Co.
Smith's English Clocks, Ltd.
Thermal Syndicate, Ltd.
Thermega, Ltd.
Tintometer, Ltd.
Vulcanised Fibre, Ltd.
Waite & Son, Ltd.
Walker Fender Co., Ltd.
West Elec. Hair Curler (of England), Ltd.

The Royal Sanitary Institute Exhibition

The Royal Sanitary Institute is holding a health exhibition at the Floral Hall, Southport, from July 6th to 11th next in connection with its forty-seventh Congress. The apparatus to be exhibited will include artificial sunlight apparatus, refrigerators, heating, cooking, lighting and ventilating appliances, house cleaning and labour-saving appliances, and the collection and disposal of refuse.

Window Displays

In the accompanying illustration we show three recent window displays of electrical interest. The top picture shows the window of the Drill Hall garage and showroom, Blackburn, outlined with "Mazda" light tubes, and on the left is a window display at the Leeds Corporation Electricity Department's showrooms, showing Moffat electric cookers in various coloured finishes. The picture on the right shows a display of English Electric domestic and heating products staged by the Bradford Corporation Electricity Department at its showrooms.

Three window displays showing (top) "Mazda" light tubes, (left) Moffat cookers, and (right) English Electric domestic and heating products

New Boiler Plant for Glasgow

Glasgow Corporation Electricity Committee on November 19th agreed to recommend the Corporation to approve two important contracts amounting to over £800,000 for plant for the Dalmarnock power station. The larger of the two contracts, amounting to £491,045, went to Messrs. Babcock & Wilcox, Ltd. This was for steam plant to supply two new turbo-alternators. The plant will generate 200,000 lb. per hour at a pressure of 625 lb. per sq. in. A contract for two 50,000-kW turbo-alternators was placed with Messrs. C. A. Parsons & Co., Ltd., whose tender was £353,770. Six tenders were submitted for the steam generating plant contract and seven for the supply of turbo-alternators. The scheme of development at Dalmarnock power station recently received the approval of the Electricity Commissioners, and is part of a provision which is being made to meet the needs in the West of Scotland for the next few years.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that a rise in the cost of living to 47 per cent. above the 1914 level will involve an increase in wages in the industry on the third pay-day in December. The new scale of weekly wages is as follows: Male time workers: District number 1, ranging from 50s. 11d. in class 1 to 56s. 9½d. in class 4; district number 2, ranging from 45s. 6d. in class 1 to 51s. 6d. in class 4. Youths and boys (fourteen-twenty): District number 1, from 13s. 8½d. to 43s. 1d.; district number 2, from 13s. to 39s. 6d.. Women (eighteen or over): From 26s. 6d. in class 1 to 30s. 6d. in class 3. Girls (fourteen-seventeen): From 13s. to 17s. 6d.

Plant Reconditioning

A well-produced photogravure brochure has been received from Messrs. Newman, Sons & Co., Ltd., Yate, Bristol, describing the company's system of reconditioning plant and illustrating many examples of the class of work carried out. The plant shown includes generators, motors, transformers, pumps, switchgear and oil engines.

A Large Cable Order

Two drums weighing 33¼ tons each were shipped by the P. & O. steamer *Rajputana* at the King George V Dock, North Woolwich, which sailed on November 22nd. The drums contained 5,000 ft. of 0.2 sq. in. three-core paper insulated, lead covered, double-wire armoured submarine cable for a river crossing, and for 15,000-V working pressure. The cable was manufactured by W. T. Henley's Telegraph Works Co., Ltd., and was lead sheathed on the Henley straight-through lead press. The transport from Gravesend works to the docks presented a little difficulty as not many cable lorries are available for such a weight. The route to the docks had to be carefully selected and the speed was limited to four miles per hour; special police permits had to be obtained. The drums were safely hoisted from the quay to the hold of the ship on Tuesday morning, November 19th, by the "London Mammoth" 150-ton floating crane.

Import Duties on Battery-operated Lamps

The Import Duties Advisory Committee gives notice of applications for increases in the import duties on the follow-

ing products: Battery-operated portable electric lamps, viz., pocket lamps, flashlamps, torches, cycle lamps, lanterns, pen lights, table lamps, and similar articles and parts thereof, but not including electric filament lamps. Any representations which interested parties may desire to make in regard to these applications should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than December 12th.

Transporting a Large Armature

One of the largest single armature reversing mill equipments made in this country is being transported this week from the Stafford works of the English Electric Co., Ltd., to the East Moor Works, Cardiff, of the British (Guest, Keen, Baldwins), Iron & Steel Co., Ltd. The armature will be capable of giving 20,000 h.p. and its total weight when erected on site will be 150 tons. It is being conveyed to Cardiff by the Marston Road Transport, Ltd., on a 14-wheeler articulated lorry and will take about a week to reach Cardiff. Some roads will have to be covered with steel plating when the lorry passes over water mains, cables, &c. The accompanying illustration shows the lorry with its load on the way to Cardiff.

An English Electric mill armature en route to Cardiff

The Isle of Man Electricity Board

The Isle of Man Electricity Board is now running a series of electrical exhibitions and cookery demonstrations in support of the million new consumers' campaign. Arrangements have been made for exhibitions to be held in ten centres on the Island during which fifty-eight cooking demonstrations will be given. In sending us this information, Mr. J. P. Tucker, engineer and secretary to the Board, also states that an amending Act has now been passed to the Board's original Act of 1932. Under this Act the Board suffered in that there was no provision for the felling or lopping of trees likely to interfere with its overhead lines. The amending Act rectifies this omission.

"Northmet" Publicity

The North Metropolitan Electric Power Supply Co. has sent us a number of specimens of its advertising, including a series of Press advertisements headed "The Electric Way is Best," which have been designed to link up with the slogan of the present E.D.A. campaign. It has also prepared an attractive card which it is circulating in its area inviting consumers to visit the "Northmet" travelling showroom when it is in their neighbourhood.

Social Events

On November 23rd Collins' Electrical, Ltd., entertained a large party of friends and members of the staff to an informal dinner-dance and cabaret at the Strand Corner House to celebrate the twenty-first anniversary of the firm. Mr. C. F. Collins, chairman of the company, presided and recalled that he had presented cheques last year to two members of the staff on their completion of twenty years' service. Two further members had completed twenty years' service and he

Mr. C. F. Collins (chairman), presiding at the dinner of the Collins Electrical, Ltd.

had pleasure in presenting gold watches to his outdoor manager, Mr. Glasse, and to Mr. Bob Pannell. This was followed by a surprise item when Miss Pannell presented Mr. Collins with a silver salver on behalf of the staff and Mrs. Collins with a bouquet. Mr. W. Haigh proposed the toast of the company, Mr. Mills replying. Further speeches were made by Messrs. W. F. Billett, A. P. Boden, T. Perkins and C. Pryce-Abbott. The speeches were interspersed with items by Leslie James and songs by Miss Peggy Collins, daughter of the chairman. After the dinner there was dancing and a cabaret show. A collection in aid of the Southall Hospital amounted to £13.

Remarkable figures illustrating the growth of the Southend Corporation's electricity undertaking were quoted at the recent annual dinner of the Department at which the borough electrical engineer, Mr. A. C. Johnson, presided. Proposing "The Undertaking," Alderman S. F. Johnson, J.P., chairman of the Electricity Committee, stated that in five years the number of consumers had increased from 23,273 to 31,320, and the sales of electricity from 17,500,000 to 38,900,000 kWh —an increase of 122 per cent. The revenue had risen from £204,600 to £265,000, while the average price received had fallen from 2.8d. to 1.6d. per kWh. The total mileage of mains in the town was now 708. Mr. Johnson, in reply, said the change-over had been very arduous work. Last month over 2,300 consumers were changed over. With regard to cookers, Southend stood fourteenth in the country, and for water heaters it stood second only to Bristol, which had a population of half a million.

The bi-annual dinner and dance of the staff of the Ever Ready Co. (Great Britain), Ltd., was held on November 18th at the Hotel Victoria, W.C., 340 people attending. Mr. Magnus Goodfellow (chairman and managing director) presided, and replied to the toast of "The Directors," which was proposed by Mr. F. W. Stevens. Mr. C. O. Stanley proposed "The Ladies," and Mrs. Goodfellow, who replied, was presented with a basket of flowers. The toast of "The Visitors" was proposed by Mr. J. Lister, and Col. T. G. Williams, D.S.O., replied.

Seven hundred employés of British Insulated Cables, Ltd., attended the annual dinner and dance organised by the Staff Guild at the Adelphi Hotel, Liverpool, on Friday last. Colonel J. Tennant, works manager and chairman of the Guild, presided, and among those present were Mr. G. H. Nisbett, managing director, Mr. W. Travis, Major A. L. Chandler and Mr. E. Taylor.

Sewage Works Lighting

With reference to the description of the electric lighting equipment for the new sludge press house of the Knostrop sewage works, Holophane, Ltd., ask us to state that Mr. R. Proctor, resident engineer of the sewage works, was active collaborator, with the electrical contractors, in planning the installation.

The Proposed Scottish C.W.S. Lamp Works

Co-operative societies in Glasgow are to make representation to the Scottish Co-operative Wholesale Society to have the proposed new lamp factory built in or near the city. A site near the S.C.W.S. factories at Shieldhall, Glasgow, is suggested. It is stated that the factory will employ over 200 women and that the directors will not consider the question of the site until the whole scheme has been approved at the next quarterly meeting.

A Lighting Centre

Extensive alterations have been made to the showrooms of Messrs. Troughton & Young, Ltd., at 145, Knightsbridge, which was reopened last Monday as "The Lighting Centre," at which artificial domestic lighting is studied from its ophthalmic as well as from its decorative and engineering aspects. The fittings displayed are designed to deal with the greater intensity of light required under modern conditions in a manner that will avoid harm to the eyes. The combination of indirect with direct light that is advocated implies the return of the lighting fitting (instead of its concealment) but as an integral part of interior decoration that can be varied with the season. Portable reading lamps, spot lights for illuminating pictures and special fittings that appear to make a room look larger are among the exhibits. Other noteworthy examples of the fittings on view are illustrated in the new editions of "Decorative Lighting" and the "Ultralux Catalogue," issued by the company. The small photometers and the eyesight tester included in the display indicate that the following foot-candles (varying with the individual) are needed as a minimum: 10 to 20 for a well-printed novel, 20 to 40 for a newspaper, and 60 to

70 for needlework. Illustrations of the showrooms appear on page 754.

Dutch Radio Exports

The value of the exports of radio apparatus from Holland increased from 3,790,000 fl. in September to 4,238,000 fl. in October, but in both cases these figures were considerably less than in the corresponding months in 1934. The total value for the ten months amounts to 33,247,000 fl. as compared with 44,703,000 fl. in the whole of 1934. In wire filament lamps the export value in the ten months reached 4,755,000 fl., as against 6,687,000 fl. for the whole of last year.

Trade Announcements

Messrs. A. J. Andrews, Ltd., have removed to 76, Duncombe Road, Upper Holloway, N.19 (telephone: Archway 4091).

Messrs. Crosland & Bateson, Ltd., electrical engineers, of Batley, have opened new showroom premises at 18, Branch Road, in that town for the display of electrical fittings and appliances.

Messrs. Brown Brothers, Ltd., are opening a new branch at 671, Christchurch Road, Boscombe, on December 2nd. The supervision of the new branch will be in the hands of Mr. D. P. Besley, the Southampton branch manager, and the local manager will be Mr. H. E. Bailey, who has had many years' experience at the Southampton and Birmingham branches.

Messrs. Clifford & Snell (Eng.), Ltd., have vacated their offices at 16, Queen Anne's Gate, S.W., so as to centralise their activities at the new works at Carshalton Road West, Sutton, Surrey.

Reduction of Capital

Cable and Wireless (Holding) Ltd., announces that its petition for confirming the reduction of the capital of the company from £53,700,000 to £47,246,593, by cancelling £6,453,467 of the 5½ per cent. cumulative preference stock, was sanctioned by the High Court of Justice on November 25th. It is hoped that the remaining necessary legal formalities will be completed in about a week's time, and that the company will be in a position to make payment early in December to those stockholders who accepted its offer to purchase their preference stock.

New Showcards

Messrs. Falk, Stadelmann & Co., Ltd., have produced an artistic showcard (shown in the accompanying illustration) in colour, which is available to all dealers and stockists of "Efesca-Servis" electric fires. This shows a young lady reading before one of the company's fires.

The other picture illustrates one of two atractive showcards produced by Thermega, Ltd., advertising its electric blankets and pads.

The Electric Lamp Service Co., Ltd., has also sent us a display piece drawing attention to its "Atlas" lamps. Provision is made on this showcard for the insertion of two lamps.

Local Exhibition

A three days' electrical exhibition was held under the auspices of the Lancashire Electric Power Co. at Tarleton recently. Mr. L. Loukes (resident engineer) stated at the opening that the idea of the exhibition was not so much to sell things as to interest the people in the use of electrical apparatus.

Hackney Municipal Laundry

Messrs. W. Steward & Co., Ltd., Cecil Chambers, 86, Strand, London, W.C.2, inform us that, under the supervision of the borough electrical engineer, they carried out the whole of the electrical installation in the new Hackney municipal laundry, described in our issue of November 15th, and also in the public baths in the same building.

Prices of Materials

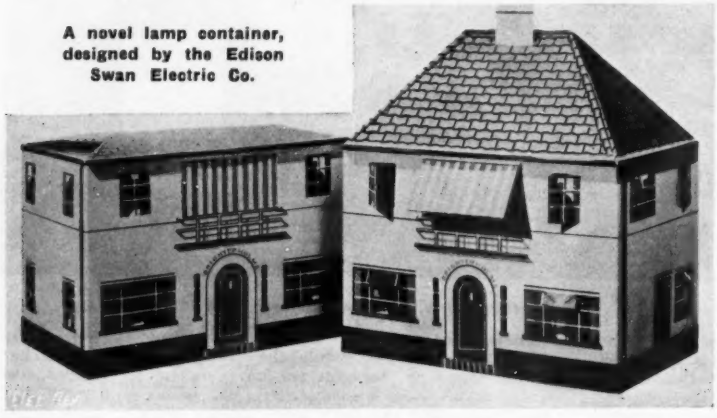
Messrs. Henry Gardner & Co., Ltd., report, November 27th: No change in the price of copper bars (best selected), sheet and rod, English pig lead and spelter. English block tin, £221, £8 decrease.

Messrs. Frederick Smith & Co., report, November 27th: No change in the price of electrolytic copper bars, wire rods and h.c. wire and silicium bronze wire.

Messrs. Edward Till & Co. report, November 27th: India rubber, Para fine, 6½d., ½d. increase.

Hotel, Restaurant and Catering Exhibition

The above exhibition opens at Olympia, London, to-day (Friday) and will continue until December 6th. A description will appear in our next issue.



A novel lamp container, designed by the Edison Swan Electric Co.

A Seasonable Sales Aid

A new sales feature which will prove attractive and make a great appeal to the children, especially at Christmas time, is the doll's house container being issued by the Edison Swan Electric Co., Ltd. This is specially designed to hold six "Royal Ediswan" coiled-coil lamps, and, in addition to a table of lamp prices, shows a pictorial chart indicating the wattages of lamps suitable for various lighting points throughout the home.

Swedish Radio Apparatus

The trade in wireless receiving sets in Sweden this year shows a large increase over 1934. It is calculated that the value of the turnover for the whole year will amount to between 30 and 35 million kr., the total sales being estimated at 150,000 to 175,000 sets at an average sale price of 200 kr. The expansion is attributed to the growing purchasing power of the public.

Copper Wire for New Zealand

New Zealand has just placed with Enfield Cable Works, Ltd., through the office of its High Commissioner, an order for 200 miles of copper conductor wire for a section of Arapuni (Auckland) hydro-electric installation. The value of the order is about £10,000.

New Electricity Showrooms

Last week the Cardiff Corporation Electricity Committee accepted the tender of Messrs. James E. Turner & Sons, Ltd., Cardiff, for the erection of the city's new electricity showrooms on the site of the old Fish Market, the Hayes, which was acquired last year by the Corporation for £25,000. The successful tender was for £24,988, and was the lowest of those submitted. According to the contract the work of reconstruction has to be completed within twelve months.

E.I.B.A. Dance at Birmingham

The fifth annual dance of the Electrical Industries Benevolent Association (Birmingham & District Branch) was held at the Magnet Club, Witton, on November 22nd. There was a record attendance of nearly 600 members and friends and it is expected that a profit of £140 will be made for the funds of the Association. Among the many well-known guests present were Mr. T. Birkett, chairman of the Branch, Mr. A. H. Seabrook, executive officer, Mr. H. N. Whitford, treasurer of

New "Thermega" and "Efesca" showcards

the Birmingham Branch, and Mr. A. G. Huddleston, secretary of the branch. The guests were entertained by Harry Pell's Band and there were numerous side-shows, games and competitions.

Mr. T. Birkett, chairman of the Birmingham and District Branch of the E.I.B.A., greeting guests at the annual dance held at the Magnet Club, Witton

New Catalogues and Lists

Stanley Electrical Co., Latimer Works, Teddington.—A leaflet dealing with a lampholder flasher.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—A leaflet on new self-contained sterilising chests.

British Electrical & Manufacturing Co., Ltd., 13, Charlotte Street, Oxford Street, London, W.1.—Particulars of the new "Floralite" fitting.

David Brown & Sons (Hudd.), Ltd., Huddersfield.—A new publication describing and illustrating "Roloid" helical rotor pumps.

G. Cohen, Sons & Co., Ltd., 600, Commercial Road, London, E.14.—A folder dealing with central heating installations.

British Thomson-Houston Co., Ltd., Rugby.—An illustrated art booklet on electrical equipment for the mining industry.

Crompton-Parkinson, Ltd., Bush House, London, W.C.2.—A new art booklet (24 pp.) on traction motors. Full technical information, with explanatory photographs, is included.

L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, Kingsway, W.C.2.—Leaflets on "Supreme" fires, the "Teesmade" set, lighting fittings, the "Pixie" heater, "Sunray Tricity" fires and suggestions for electrical Christmas gifts.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A new publication dealing with mechanical draught.

Bankruptcy Proceedings

S. G. Penrith, 50, Mount Pleasant, Barrow-in-Furness, lately 5 and 14, Mount Pleasant, Barrow-in-Furness, electrical contractor.—The public examination herein was held recently at the Magistrates' Court, Barrow-in-Furness. The statement of affairs showed gross liabilities of £243 with a deficiency of £217. Debtor attributed his failure to lack of capital and competition. He said that he had served his apprenticeship as an electrician, and in September, 1932, opened the business at 14, Mount Pleasant, Barrow. In July last creditors were pressing, and debtor gave up trading at the shop and rented a small warehouse. Subsequently creditors levied execution, and he ceased trading altogether. The examination was closed.

R. L. D. Mathews, 24, Kingsway Road, Burnham-on-Sea, Somerset, wireless and electrical engineer.—The public examination herein took place at the County Court offices, Bridgwater, recently. The statement of affairs filed showed a deficiency of £151. Debtor said his failure was due to want of capital, competition, and bad debts. The examination was closed.

W. E. James, radio engineer and wireless merchant, 8, Church Street, Ebbw Vale.—Receiving order made November 18th on debtor's own petition.

F. Cox, electrical engineer, 16, Crown Street, Newark-on-Trent.—First meeting November 29th at 22, Regent Street, Park Row, Nottingham. Public examination January 2nd at the County Court House, St. Peter's Gate, Nottingham.

A. J. Penn (Northampton Installation Co.), electrical engineer and contractor, 26B, Barrack Road, and 43, Gladstone Terrace, Northampton.—First meeting November 27th at 6, The Parade, Northampton. Public examination December 6th at the County Hall, Northampton.

C. Worden, electrical and radio engineer, 89, Duckworth Street, Darwen.—First and final dividend of 2s. 8½d., payable November 25th at 7, Lord Street West, Blackburn.

F. Cox, electrical engineer, 16, Crown Street, Newark-on-Trent.—Receiving order made November 16th on debtor's own petition.

D. V. Briggs, radio engineer, Eastwood, Pillmawr Road, Malpas.—First meeting November 26th at 22, Stow Hill, Newport (Mon.). Public examination January 14th at the Town Hall, Newport (Mon.).

Company Liquidations

Miller & Co. (Radio), Ltd., South Harrow, East Ham and Colindale.—The statutory first meetings of the creditors and shareholders under the compulsory liquidation of this company were held on November 20th at the Board of Trade Offices, Carey Street, W.C. A statement of affairs was presented showing total liabilities of £1,256 (ranking £932), assets £786, an issued capital of £913, and a deficiency of £1,059 to contributories. The failure of the company was attributed to its inability to obtain sufficient capital to provide for the rapidly expanding business and to the overhead expenses having been too high in relation to the turnover. A resolution was passed for Mr. Chas. Latham, C.A., to act as liquidator with a committee of inspection.

Gordons (Thornton Heath), Ltd.—Meetings December 19th at 15, Eastcheap, E.C.3, to receive an account of the winding up by the liquidator, Mr. O. G. Sunderland.

Dissolution of Partnership

The Micalac Co., electrical engineers, 103, New Bridge Street, Newcastle-on-Tyne.—Messrs. H. Bowen and N. Miller have dissolved partnership. Mr. Miller will attend to debts and carry on the business.

A Modern Electro-plating Plant

IT is three years since Messrs. James Neill & Co. (Sheffield), Ltd., installed plant for electro-plating the parts used in the manufacture of their "Eclipse" hack-saw frames, tools, razors, permanent magnets and other products. This installation included equipment necessary for silver, nickel, copper and cadmium plating, but the demands made upon the plant were so great that it has been found necessary to erect new self-contained premises equipped with increased plant working under modern conditions. Included in this new equipment is a chromium-plating plant. This latest extension adjoins the company's steel warehouse and research laboratories, and has separate departments for polishing and preparation, general plating and chromium plating, together with a control section which combines a plating laboratory and an administrative office. All the power, heating and ventilating plant is housed separately in a basement to prevent deterioration of the electrical generating equipment from the plating fumes and to facilitate maintenance without interference with other processes.

A feature of the new premises is the special treatment of the walls, girders and ceilings with metallic paint which not only gives a maximum light reflection with even diffusion, but also ensures cleanliness and protection from the steam and fumes usually associated with electro-plating, while the floors are adequately drained and treated with an acid-resisting protective coating. The main part of the building is arranged to house two separate departments. Work first of all enters the polishing and preparation section at one end of which the necessary glazing and buffing is undertaken. It is then passed into the general plating shop where, after passing through a system of chemical and electrolytic cleaning, the actual plating process is embarked upon. It is interesting to note that nickel is deposited direct upon the steel base without a primary coating of copper. Special timing apparatus is installed to ensure uniform results and correct regulation of the various depositions, and agitation equipment is provided if necessary. The all-important question of temperature control has received special attention, and there is a dual system of heating and ventilation. For ease in plating the various small irregularly shaped parts, special suspenders or jigs, have been designed so that the vats will accommodate the maximum number and at the same time reduce the time spent in recharging and handling to the absolute minimum. After passing through the plating shop the articles are returned to the polishing department, where polishing and finishing complete the process.

The main plating department

The chromium-plating department is housed entirely separate from the main plating shop. Here special care has been taken in the ventilation and exhaust system so that there is a continual flow of fresh air. The whole of the equipment was supplied by Messrs. W. Canning & Co., Ltd.

Electricity Supply

Lighting, Domestic, Power

Bedfordshire.—RURAL SUPPLIES.—While consenting to an application of the Rushden Electric Supply Co., Ltd., for permission to erect overhead l.v. lines at Sharnbrook, the Bedford Rural District Council has decided once again to urge the company to make supplies available at Wymington and Podington.

Brazil.—HYDRO-ELECTRIC SCHEME.—A note in our last issue referred to the alternators at the new Bello-Horizonte power station as made by the A.E.G. instead of the A.C.E.C. (Ateliers de Constructions Electriques de Charleroi).

Croydon.—SUPPLY EXTENSIONS TO LARGE BUILDINGS.—Arrangements have been made by the Electricity Committee for a supply to be given to the new cinema of Associated British Cinemas, Ltd., in London Road, Thornton Heath, at a cost of £863, and to two blocks of all-electric flats and two further blocks to be erected at Lansdowne Court, Brighton Road (£564). Further, an additional supply to the stores of Messrs. Kennards, Ltd., at North End, is to be provided at a cost of £2,770.

LOANS.—Application for permission to borrow £10,000 for sub-station extensions is being made by the Electricity Committee. Sanction has been obtained to a loan of £10,958 for plant and switchgear.

Denmark.—ELECTRICITY PRODUCTION AND CONSUMPTION.—Our Copenhagen correspondent reports that, on the basis of information obtained from power stations generating 96 per cent. of the total output, electricity production during the first three quarters of 1935 amounted to 399.4 million kWh (compared with 420.1 million kWh for the same period of 1934). In addition, 59.2 million kWh (19.5 million kWh) was imported from Sweden, while 8.07 million kWh (38.2 million kWh) was exported. The figures for consumption were 450.5 million kWh (401.4 million kWh). The national production, therefore, decreased by 20.7 million kWh; at the same time, imports exceeded exports by more than 51 million kWh, as compared with an excess of exports over imports amounting to 18.7 million kWh during the previous year.

Denton (Lancs).—GAS NOT WANTED.—The Urban District Council is considering the question of installing electric lighting in Council houses at present served by gas, following requests from the tenants of two estates.

Doncaster.—ILLUMINATIONS.—So successful was the scheme for illuminating the main streets of Doncaster with coloured lights last year that it is to be repeated and extended this Christmas. The work is to be done by the Electricity Department, the Chamber of Trade contributing.

A photograph of electric-discharge lighting at Leyton taken during slight fog

Egypt.—A HYDRO-ELECTRIC PROJECT.—It is reported from Cairo that negotiations are proceeding between the Government of Egypt and representatives of the Imperial Chemical Industries, Ltd., in regard to a concession to utilise the falls at Assuan for the production of electrical energy and the manufacture of fertilisers. It is stated that the I.C.I. would be associated with the English Electric Co. in the execution of the work. Other schemes have been examined as submitted by American and German concerns, and these would be taken into consideration in the event of the present negotiations proving unfavourable.

France.—PRODUCTION OF ELECTRICITY.—Figures published by the Ministry of Public Works show that during the first nine months of this year electrical production has been 1.8 per cent. more than in the same period of last year. While thermal plants generated less energy (2,788.4 million kWh against 3,058.9 million kWh last year), the hydraulic output was considerably higher (5,202.7 million kWh, compared with 4,789.4 million kWh last year). For the month of September the improvement was proportionately greater than for the whole of the year. Thermal energy produced during September amounted to 345.8 million kWh, against 339.5 million kWh in September, 1934. Hydraulic production amounted to 548.1 million kWh against 508.8 million kWh last year.

Hendon.—SUB-STATION.—The North Metropolitan Electric Power Supply Co. is to erect a sub-station at the side of the Watford by-pass road.

Herne Bay.—OVERHEAD LINE.—The Urban District Council has decided to raise no objection to the South-East Kent Electric Power Co., Ltd., constructing a 11,000-V overhead line from Broad Oak to West Blean.

Hertford.—PLAN TO IMPROVE PUBLIC LIGHTING.—In a recent statement the Mayor said it was hoped soon to place before the Council a comprehensive scheme for improving the public lighting of the borough.

Irish Free State.—ACQUISITION OF KILLORGLIN COMPANY.—Arrangements have been made for the Electricity Supply Board to take over the premises and undertaking of the Killorglin Electric Light Co. on April 1st, 1936. It is understood that an offer of 30s. per £1 share has been made to the shareholders of the company.

DUBLIN HYDRO-ELECTRIC SCHEME.—About 5,000 acres of land in the outlying districts of Poulaphouca, Blessington and Barrymore Eustace are now being officially valued. The lands are to form the bed of the reservoir which will be constructed for supplying water to the City of Dublin, and for generating electricity for the Electricity Supply Board under the terms of the proposal now being considered by the Ministry of Industry and Commerce. Last week Mr. T. H. Nolan, of the Electricity Supply Board engineering staff, carried out tests at Poulaphouca in connection with the plans for the construction of a tunnel to convey the water from the reservoir to the proposed power house.

Jugo-Slavia.—DEVELOPMENTS.—It is announced from Agram that a big scheme of electrification, covering the whole of Slovenia, is proposed by the Ljubljana authorities. The expenditure on long-distance transmission lines and transformer stations alone is estimated at 70,000,000 dinar, while the local networks will be provided by the communes and industries.

Kent.—ELECTRICAL INSTALLATIONS AT TWO INSTITUTIONS.—The Public Assistance Committee is to have electricity installed throughout the Isle of Thanet Institution and the Faversham Institution.

Leyton.—ELECTRIC-DISCHARGE LIGHTING.—Good progress is being made with a scheme for converting the street lighting in all the main roads—covering about six miles—to the electric-discharge system, and it is hoped that the work will be completed before the end of the year. The accompanying photograph, taken during slight but quite perceptible fog, shows the high degree of visibility provided under such conditions by this form of lighting. The installation illustrated is in Grove Green Road, where 400-W "Mazda Mercra" lamps in "Mercra H" lanterns are installed.

London.—BATTERSEA.—The Electricity Committee recommends a scheme for the provision of heating points, on the lines of the rental wiring scheme, at a quarterly charge of 1s. 3d. per point.

BERMONDSEY.—In connection with the new health centre in Grange Road, the Health Committee considered the question of which method of heating it should adopt, and compared reports on various systems. It decided that, in the interests of cleanliness and efficiency, electricity should be used for both heating and lighting.

HAMMERSMITH.—For mains, services, and sub-station equipment the Electricity Commissioners have sanctioned the loan of £20,119.

LAMBETH.—Altogether approximately 28,500 ft. of paper-insulated main cable and 14,550 ft. of rubber-insulated cable in various sizes and finishes have been supplied by British Insulated Cables, Ltd., to the South London Electric Supply Corporation in connection with the supply company's contract to light twenty miles of streets in Lambeth for the Borough Council. The B.I. Company is also supplying 400 single-pole cut-outs and 400 new terminal boxes in moulded insulating material.

ST. PANCRAS.—To meet immediate requirements in connection with the provision of a supply of electricity to 800 flats now in course of erection at Osnaburgh Terrace it is proposed to install additional switchgear and transformers costing £3,000 at the Electricity Department's Regent's Park sub-station. Arrangements have been made with the Grand Union Canal Co. for a wayleave permitting the Department to suspend cables from the under part of the company's Chalk Farm bridge in effecting a crossing of the canal so as to provide a supply to the Council's Ferdinand Place estate, while mains extensions are proposed in various streets at an estimated cost of £738. Sanction has been received to loans amounting to £4,801 in respect of new h.v. and l.v. mains.

Lymington.—CHEAPER ELECTRICITY IN TWO AREAS.—Reduced charges for electricity in the New Milton and Milford-on-Sea areas, which will operate from January 1st, were announced at a meeting of the Lymington Borough Council recently. At New Milton a business two-part tariff is to be introduced, with a standing charge of £12 10s. per annum per kW of installed lighting, and a running charge of ¾d. per kWh. The "unit" charge under the domestic two-part tariff is to be reduced from 1d. to ¾d., and the power tariff will be

lowered from 4d. per kWh to 3½d. per kWh for the first 50 kWh per h.p. per quarter and ¾d. per kWh thereafter. In the Milford-on-Sea area the flat rate for lighting will be reduced from 10d. to 8d. per kWh. Two-part tariffs for domestic and business purposes are to be introduced on the same basis as in the New Milton area, and the power tariff will also be reduced as at New Milton.

Manchester.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Ministry of Transport a Special Order authorising the extension of the Corporation's area to include Carrington and part of Partington in the rural district of Bucklow.

Rothesay.—POWER STATION EXTENSION.—The Town Council has authorised the extension of the electricity station at a cost of about £10,000.

Stafford.—FAILURE OF SUPPLY.—The North-West Midlands Joint Electricity Authority owns the Stoke and Stafford generating stations, each of which is connected to the grid. There is also a 33-kV transmission line (belonging to the J.E.A.) of smaller capacity connecting the two stations, and passing through Whitmore, Market Drayton and Eccleshall. At 2.46 p.m. on November 20th the feeder switch at Stafford controlling the Authority's 33-kV line was closed to supply the section as far as Market Drayton. Owing to a fault having developed on this line, a heavy duty was imposed on the

Electric-discharge lighting in a Hanley foundry (see Stoke)

switch and failure occurred. The operation of the protective relays on the grid supply prevented further damage, but caused temporary disconnection from the grid. Immediately afterwards examination of the bus-bars showed the advisability of transferring the outgoing feeder connections to the reserve bus-bars, after which the grid supply was reconnected. The whole of the supply to the districts affected was restored at 4.41 p.m.

Stoke-on-Trent.—INDUSTRIAL LIGHTING.—The Ivy House Foundry, Hanley, has recently been illuminated by eight 400-W "Osira" electric-discharge lamps. The installation was carried out by Messrs. H. E. Hawley for the proprietors, Messrs. R. Goodwin & Sons.

MAINS EXTENSION.—The Electricity Committee is to extend mains at a cost of £675 to the Elgin Street district of Fenton, while the supply is to be improved in the Trentham Road area of Longton at a cost of £700. A three-phase main is to be laid in the Joiners Square area of Hanley at a cost of £650, and the Committee is to provide supply at the Central Mills of Messrs. Harrison & Son (Hanley), Ltd., at a cost of £350.

Sutton Coldfield.—SUPPLY IMPROVEMENTS.—The Electricity Committee is to improve supplies in the central area at a cost of £2,035.

Upholland.—EXTENSIONS.—The Urban District Council has requested the Wigan Corporation to extend its supply to Aspinall Farm and to Tower Hill.

Traction

France.—NEW TROLLEY-BUS SERVICES.—Two services of electric trolley-buses are about to be started in the south-eastern area of Lyons.

ELECTRIC CABLE RAILWAY.—An electrically-operated ropeway with suspended cars has recently been completed between Mentens, near Aix-les-Bains, and the summit of Mont Revard The ropeway between the terminal stations consists of a single span 1,749 yd. long. The operating plant, which is installed at the Mentens station, comprises two electric motors, one of which is kept as a standby and arranged to be driven either by power from the local electrical distribution system or by a petrol-engine set.

Glasgow.—SUBWAY ELECTRIFICATION.—To enable the outer circle of the Subway to be changed over from cable to electric operation the whole system will be closed on December 1st. The inner circle, electrification of which was completed last March and which has operated with marked success since then, will be reopened on Monday, while the outer circle will remain closed until the new equipment has been inspected on behalf of the Ministry of Transport. After the inspection a luncheon will be held to celebrate the completion of the electrification scheme.

London.—STILL MORE TROLLEY-BUSES.—On Sunday last trolley-buses replaced trams on the whole of the route from Woolwich to Dartford *via* Welling and Bexleyheath. The new services, which start from the Free Ferry at Woolwich, provide a convenient connection for passengers coming from the north side of the Thames. Part of the new route—between Woolwich Free Ferry and Wickham Lane, Plumstead—is already covered by the trolley-bus service to Bexleyheath

Supply Progress in Portugal

A REPORT which has recently been issued by Mr. Ferreira Dias, chief engineer to the Portuguese Government Department of Hydraulic and Electrical Services, shows that at the end of last year there were 602 generating stations in the country, with a total installed capacity of 210,762 kW, as compared with only 569 and 206,998 kW respectively at the end of 1933.

Ninety-five of the stations, representing 53,241 kW, are hydro-electric, while 507 (155,521 kW) are operated either by steam or internal-combustion engines. Of the thirty-three additional stations seven are publicly and twenty-six privately owned. In all 177 stations, aggregating 160,833 kW, are engaged in the supply of power to the public and for traction purposes, while 425 stations (49,929 kW) are privately owned.

Most of the public utility plants are of a small character, the average capacity being about 900 kW; only seven stations have a capacity of over 5,000 kW, the aggregate of these being 121,686 kW. In the case of the privately owned plants the average capacity is even smaller, being only about 118 kW, and the average of the five largest is 1,969 kW.

The total output of electric power in the country during 1934 is given as nearly 325 million kWh, as compared with 302 million kWh in the previous twelve months, an increase of about 7.5 per cent. Hydro-electric plants were responsible for 102.8 million kWh, and steam and internal-combustion engined stations for the remainder. Mr. Dias draws special attention to the possibilities of further developments in water-power utilisation. He points out that in Portugal the output of hydro-electric power is only about 32 per cent. of the aggregate production; in Italy over 93 per cent. of the production is furnished by hydro-electric installations. Public-utility stations produced 270.2 million kWh.

The three principal undertakings in Portugal are the Companhia Reunida Gas e Electricidade, of Lisbon, with an output of 80 million kWh, the Electrica dal Lima e Uniao Portugesa with nearly 72 million kWh, and the Companhia Carris de Ferro, Lisbon, with 25.2 million kWh. The total number of electricity consumers in the country increased during the year from 233,025 to 248,723. Of these, 99,754 are in the Lisbon district, with an aggregate consumption of 99.8 million kWh, and 54,137 in the Oporto area, with a consumption of 78.4 million kWh.

Of the total consumption 20.7 per cent. was utilised for traction purposes, 3.3 per cent. by the electro-chemical industries, 51.7 per cent. for various power purposes, and the remaining 24.3 per cent. for public and private lighting.

A further table shows that of the 6,191,000 population of the country, electricity supplies are now available to 5,603,496. The annual consumption per person to whom public supply is available ranged from only 25 kWh in the province of Bragança to 113.1 kWh in the Lisbon area and 98.5 kWh in the Oporto district; the average for the whole country is only 44.4 kWh per year, including the output of the privately owned plants, this being, however, an advance from 43.2 kWh in 1933. As regards individual cities, Oporto is the most important electricity user, the average annual consumption per inhabitant for all purposes, including public lighting and traction, being 199.7 kWh as against 144.5 kWh for Lisbon.

As regards distribution, there are now about 2,263 miles of h.p. lines in Portugal, an increase from 2,012 miles at the end of 1933; about 1,980 miles are overhead and the remainder underground. Of the overhead lines 1,480 miles operate at pressures up to 25 kV, 323 miles between 25 and 50 kV and 177 miles at over 50 kV. The bulk of the overhead lines (1,378 miles) is supported on steel masts, only 183 miles being on ferro-concrete masts, 287 miles on wooden poles and 132 miles employing iron and wooden poles. In connection with the transmission lines, a table shows that there are now 1,460 transformer stations and posts with a combined capacity of 139,784 kW.

One page of the report is devoted to electric traction and shows that there are only six electric tramway and railway undertakings in the country, two municipal and four privately owned, with a total track length of 225 miles. As with lighting, the most important tramway undertakings are those in Lisbon and Oporto, the fleet of the first-named comprising 348 motor-equipped and fifty trailer cars and that in Oporto 219 vehicles, of which 190 are motor-equipped.

via Erith, which has recently put into operation, the new section being from Wickham Lane *via* Welling and Bexleyheath to Market Street, Dartford, a distance of approximately seven miles. Trams will no longer run between Dartford and Horns Cross, but the bus services in this district have been reorganised and increased to cover their withdrawal. The total trolley-bus mileage in operation in the district is now fifteen miles, and throughout the Board's area forty-eight miles.

Newcastle-on-Tyne.—BATTERIES FOR TROLLEY-BUSES.—The City Council has confirmed a proposal of the Transport and Electricity Committee to equip the trolley-buses operating in the area with batteries to enable them to move short distances under their own power in cases of a supply failure.

Norway.—REGENERATIVE BRAKING.—Electric trains incorporating regenerative braking and fitted with accumulators are being tested on the Holmenkol railway.

Communications

France.—MARSEILLES TESTS.—It is reported that the new Marseilles transmitter is testing on 100 kW after 11 p.m.

Great Britain.—EFFECT OF CHEAPER TELEGRAMS.—According to the *Financial Times* Major Tryon, the Postmaster-General, speaking at Belfast, where he inspected the city's new automatic exchange, said that while the reduction in the charge for telegrams from 1s. to 6d. had resulted in an increase of 30 per cent. in the traffic, there had been a 50 per cent. increase in the financial loss. He mentioned also that, in spite of the mechanisation, the Post Office was to-day employing 9,000 more people than it did at the beginning of the year.

FLOOD DAMAGE TO TELEPHONES.—Last week's floods affected a considerable number of telephone circuits, particularly in the north of England. Communication was held up between London, Belfast, Aberdeen, Edinburgh and Glasgow, sixty-three of the sixty-seven lines being out of action. All the twenty-seven circuits serving Edinburgh were affected, while Belfast had only two lines to London (usually seven) and Aberdeen and Glasgow one each (normally nine and twenty-four respectively).

Jamaica.—LINK WITH GRAND CAYMAN.—A wireless telegraph station has been installed by Cable and Wireless, Ltd., at Georgetown, the capital of Grand Cayman, which is the chief of a group of islands lying 178 miles north-west of Jamaica and forming part of that colony. The station is to be operated by the Government in conjunction with a meteorological station; it will furnish meteorological reports to Jamaica and Cuba, and will maintain telegraphic communication with the wireless station at Kingston, Jamaica. The need for such communication was demonstrated by the fact that the hurricane which ravaged the western region of Jamaica some time ago must have passed over Cayman, but the only means of obtaining information was by sending an aeroplane from Jamaica for that purpose. On the occasion of the opening of the station on Saturday, Cable and Wireless, Ltd., made arrangements enabling the Governor of Jamaica to broadcast a message to the people of Grand Cayman assembled for the ceremony. The charge for ordinary telegrams from Great Britain to Grand Cayman will be 2s. 8d. per word.

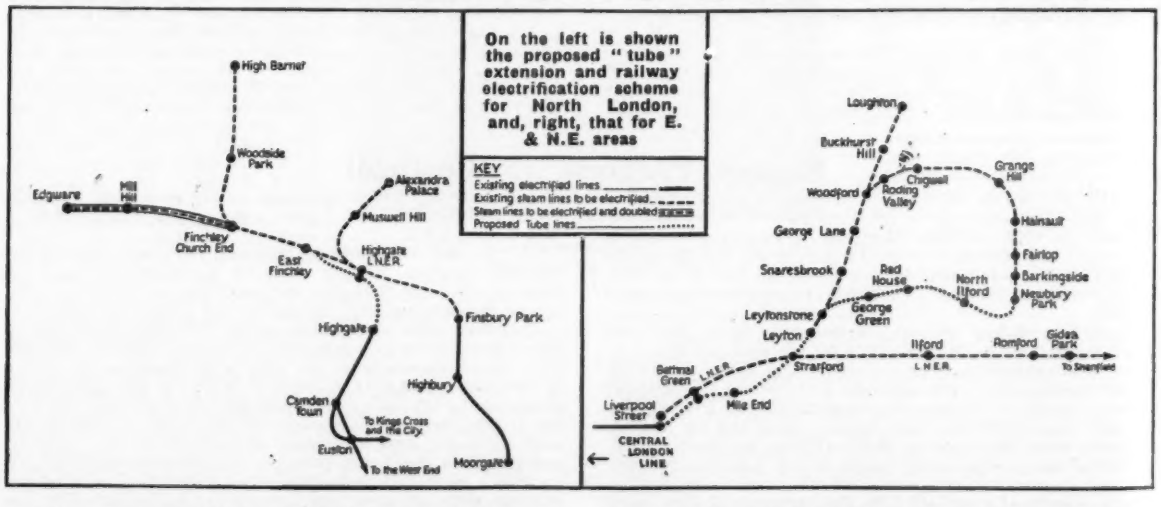
Transport Developments in Greater London

THE London Passenger Transport Board is promoting a Bill in the forthcoming Session of Parliament to secure the powers necessary for the execution of its share of the transport developments in London, which were announced by the Chancellor of the Exchequer in the House of Commons last June. The most important proposal is the extension eastward of the Central London Underground Railway from Liverpool Street, its present terminus, to Stratford Station, and the building of new lines in continuation of this extension between Stratford and Leyton (L.N.E.R.); from Leyton the Central London line trains will run over the L.N.E.R. tracks to Leytonstone; further new lines will be built between Leytonstone (L.N.E.R.) and Newbury Park *via* North Ilford. These new lines, with the electrification of the L.N.E.R. Loughton and Grange Hill branches, will enable Central London line trains to be run between these branches and the City and West End. Stations are contemplated at Bethnal Green, Mile End and Stratford. At Mile End it is proposed that there should be platform interchange with the District train service and the Metropolitan service, which is shortly to be provided. At Stratford the tube will come to the surface so that there can be platform interchange with the L.N.E.R. Shenfield service, which is to be operated by electric trains. Thence the line will continue again underground to Leyton to form a junction with the L.N.E.R. Loughton line. From Leytonstone, the next station on the underground railway will be constructed at George Green, the line running in an easterly direction *via* Wanstead and along the line of Eastern Avenue, with further stations at Red House and North Ilford, until it reaches a point near Newbury Park, where it will come to the surface to form a junction with the L.N.E.R. Grange Hill loop line. Powers will also be sought to lengthen the station platforms on the existing Central London line to accommodate eight-car trains.

It is proposed to extend the Highgate line of the Morden tube northwards to East Finchley, where it will join the L.N.E.R. Edgware and High Barnet lines. These lines will be electrified so that tube trains can be run through from both of them to the City and West Central area, *via* Camden Town. There will be a tube station on this new link at Highgate, L.N.E.R. Station, where interchange facilities will be provided with the Alexandra Palace line, which will also be electrified. A connection will also be built between the L.N.E.R. electrified lines and the Northern City tube railway at Finsbury Park so that trains can be run through to Moorgate from Edgware, High Barnet and Alexandra Palace.

At Edgware a joint station will be built to serve both the Board's Morden to Edgware line and the L.N.E.R. line.

It is proposed to lengthen station platforms on the Bakerloo line to accommodate eight-car trains in connection with the Board's scheme to link up the Bakerloo and Metropolitan lines; to provide escalators to improve access from Earls Court Station to the Earls Court Exhibition Grounds, which are being developed as an exhibition and sports centre; and to install escalators at South Kensington Station and Edgware Road Station.



Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Australia.—MELBOURNE.—January 13th. Electric Supply Committee. 6,600-V and 22,000-V switchgear for the Waratah Place sub-station. (T.Y. 10214/5.)*

January 13th. State Electricity Commission of Victoria. Two compound-filled feeder circuit-breaker units. (T.Y. 10209.)*

January 15th. Victoria Railways Commission. R.i. taped and braided copper conductors. (T.Y. 10212.)*

Barking.—December 3rd. Electricity Department. L.p., p.i. cables. (November 15th.)

December 16th. Essex C.C. Education Committee. Electrical installation at South-East Essex Technical College. (See this issue.)

Birmingham.—Public Health, Maternity and Child Welfare Committee. Various work, including electric cable work, lighting and fire installations, clocks, staff locators, telephones, bells and indicators and lift at a new maternity and ante-natal block at the Dudley Road hospital. F. H. C. Wiltshire, town clerk, Council House (deposit £2 2s.) by December 2nd.

Birtley (Co. DURHAM).—December 6th. Provision and erection of electric-discharge lamps. (See this issue.)

Blackpool.—December 11th. Electricity Department. Transformers. (See this issue.)

Brighton.—December 9th. Electricity Department. Oil immersed three-phase reactor. (November 22nd.)

Cardiff.—December 9th. Electricity Department. Switchgear. (See this issue.)

Cheadle & Gatley.—December 13th. Electricity Department. One 350-kVA transformer with manually operated on-load tap changer. (See this issue.)

East Kesteven.—November 30th. R.D.C. Electric automatic pumping plant (5,000 gal. per hour). E. H. Sills, engineer, Council Offices, Northgate, Sleaford.

Egypt.—CAIRO.—December 18th. Ministry of Public Works. One Diesel-driven 5-kW d.c. generating set, complete with switchboard, &c., for the Nubian floating workshop. (T.Y. 10210.)*

KHARTOUM.—December 29th. Ministry of Public Works. Fifty-six a.c. ceiling-type electric fans with speed regulators. (T.Y.10238.)*

Farnworth.—December 12th. Electricity Department. L.p. cables, transformer and l.p. switchgear. (See this issue.)

Fife.—December 3rd. County Council. Various works, including electrical, in classrooms at Kirkcaldy West School. G. Sandilands, County master of works, Property and Works Department, Education Offices, Wemyssfield (deposit £1 1s.).

Glasgow.—December 5th. Corporation. Electrical installation at 118 houses on the Ardgay housing estate. Town Clerk's Department, Room 36.

Gloucester.—Electricity Department. One 200-kVA outdoor transformer. (See this issue.)

Haddington.—November 30th. Electrical work and additions to Vent Memorial Hospital. J. Douglas Miller, architect, 5, Forres Street, Edinburgh (deposit £2 2s.).

Heston and Isleworth.—December 9th. Electricity Department. E.h.p. cables, transformers and switchgear. (November 22nd.)

December 13th. Street-lighting equipment. (See this issue.)

India.—December 6th. Bombay, Baroda and Central India Railway Co. Lamps. (November 22nd.)

Irish Free State.—DUBLIN.—December 31st. Electricity Supply Board. P.i. cables; 40-kV underground power cables and jointing accessories in Dublin. (November 22nd.)

London.—CENTRAL ELECTRICITY BOARD.—December 9th. 66-kV overhead transmission lines for the North-West England and North Wales Electricity Scheme. (November 1st.)

Manchester.—December 9th. Watch Committee. Electric passenger lift at the chief fire station. City architect, Town Hall (deposit £1 1s.).

December 30th. Electricity Committee. Two water-tube boilers. (See this issue.)

New Zealand.—WELLINGTON.—December 17th. Public Works Department. Three 150-kVA oil-immersed transformers. (T.Y. 10197.)*

Post and Telegraph Department. January 14th. Twenty-five secondary cells (T.Y. 10225.)* 24,600 switchboard cords. (T.Y. 10231.)*

January 21st. 3,000 metal-cased condensers. (T.Y. 10234.)*

Oldham.—December 2nd. Electricity Committee. Earthenware conduit. (November 22nd.)

Penicuik.—November 30th. Town Council. Electric lighting at forty-four houses. Morham & Brotchie, surveyors, 29, Hanover Street, Edinburgh.

Plymouth.—December 7th. Corporation. 33,000-V switchgear, 33,000/6,600-V transformers, and auxiliary apparatus. (November 8th.)

Portsmouth.—December 2nd. Corporation. P.i. and v.i.r. cable. (November 22nd.)

Rotherham.—December 7th. One 300-kW rectifier equipment and switchgear for traction duty. T. P. Sykes, transport manager. Municipal Buildings, Howard Street.

Scunthorpe and Frodingham.—December 9th. U.D.C. Pilot cable for North Lindsey water scheme. (See this issue.)

Sheffield.—December 30th. Electricity Department. Four water tube boilers. (See this issue.)

Stanley (DURHAM).—December 12th. Electricity Department. Meters, lamps, cables and wiring supplies. (November 22nd.)

Wembley.—November 30th. U.D.C. Carcase wiring for ninety-six cottages on the Manor Farm estate. (November 8th.)

West Riding.—County Council Education Department. Electric lighting at Gildersome Gelderd Road Council school. L. J. Blackburn, divisional clerk, 8, St. John's North, Wakefield.

Wimbledon.—December 9th. Corporation. 11,000-V and 2,200-V p.i. power cables and pilot cable. (See this issue.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Annan (DUMFRIESSHIRE).—Town Council. Accepted. Electrical work at housing scheme (£147).—T. Duff.

Heckmondwike.—U.D.C. Accepted. Work in connection with the changeover.—W. T. Henley's Telegraph Works Co., Ltd.; Ferranti, Ltd.; A. Reyrolle & Co., Ltd.

London.—DEPTFORD.—Health Committee. Accepted. Electrical installation at mortuary and coroner's court (£116).—Pruden & Pope. This was the lowest of six tenders, the highest being £201.

ST. PANCRAS.—Contracts and Stores Committee. Three 500-kVA transformers :—

	£
British Electric Transformer Co., Ltd. ...	187 each
Brush Electrical Engineering Co., Ltd. ...	187 ,,
Ferranti, Ltd.	187 ,,
Fuller Electrical & Manufacturing Co., Ltd....	187 ,,
General Electric Co., Ltd. (Recommended) ...	**187** ,,
Yorkshire Electric Transformer Co., Ltd. ...	195 ,,
British Thomson-Houston Co., Ltd. ...	231 ,,
English Electric Co., Ltd.	281 ,,
Hackbridge Electric Construction Co., Ltd. ...	284 ,,
Metropolitan-Vickers Electrical Co., Ltd. ...	284 ,,
C. A. Parsons & Co., Ltd.	284 ,,
Bruce, Peebles & Co., Ltd.	286 ,,

Recommended. Three l.p. switchboards (£2,094).—Crompton Parkinson, Ltd. Alterations to existing l.p. switchboard (£222).—English Electric Co., Ltd. Three h.p. switchboards (£1,689).—A. Reyrolle & Co., Ltd. Seventy-five 400-W electric-discharge lamps and fittings (£746).—Siemens Electric Lamps & Supplies, Ltd. Replacement of motors and wiring made necessary through change from d.c. to a.c. at Albany Street barracks (£62).—City Electrical Co., Ltd., and at Crown Garage, Albany Street (£64).—Hopkinsons Induction Motors.

BATTERSEA.—Electricity Committee. Recommended. Two transformers (£555).—British Electric Transformer Co., Ltd. Switchgear.—Crompton Parkinson, Ltd. (£475).—J. G. Statter & Co., Ltd. (£421).

STOKE NEWINGTON.—Electricity Committee. Recommended. Disconnecting cable boxes (£150).—British Insulated Cables, Ltd.

L.C.C.—In our issue of November 15th we stated that the L.C.C. had accepted the tender of Henfrey Electrical Installations, Ltd., for electric lighting and heating at the Central School and Millfields Road School, Hackney. We are asked to point out that this concern is not a limited company, its full title being Henfrey Electrical Installations.

Marlborough.—Town Council. Accepted. Cables, &c. (£3,745).—W. T. Henley's Telegraph Works Co., Ltd. Distribution transformers (£480).—Fuller Electrical & Manufacturing Co., Ltd.

Middlesex.—Health Committee. Electric lighting at reconstructed wards at the Central Hospital :—

	£
Electrical Installations, Ltd. (Accepted)	**1,323**
Pernot & Co., Ltd.	1,420
F. Troy & Co., Ltd.	1,609
Dynamo & Motor Repairs, Ltd....	1,692
"Grensells"	1,775
Colston Electrical Co., Ltd.	1,898
J. H. Plant, Ltd.	1,946
Wiring, Ltd.	1,964
Knight & Hitchcox, Ltd.	1,999
Building & Colliery Supply Co.	2,188
General Electrical Construction & Maintenance, Ltd.	2,570
Phillips & Sons (Electrical), Ltd.	2,706

South Africa.—CAPE TOWN.—Finance Committee. Accepted. Sound amplifying equipment at the Grand Hall (£237).—South African General Electric Co., Ltd.

Electricity Committee. Accepted. Cables.—Siemens Bros & Co., Ltd. (£3,350); A.E.C. Engineering Co., Ltd. (£3,788). Overhead line material (£326).—Jones Evans. 400 street-lighting fittings (£376).—C. E. Scott, Ltd. Switchgear (£14,492).—A. Reyrolle & Co., Ltd.

Sunderland.—Town Council. Accepted. Cables.—British Insulated Cables, Ltd.; Edison Swan Electric Co., Ltd. V.i.r. insulated wire.—Hackbridge Cable Co., Ltd. Electric lamps and irons.—General Electric Co., Ltd. Meters.—British Sangamo Co., Ltd.; Ferranti, Ltd. Water heaters.—A. Reyrolle & Co., Ltd. Two 1,500-kW steel tank rectifiers (£11,130).—General Electric Co., Ltd. Switchgear (£2,571).—A. Reyrolle & Co., Ltd.

Sutton Coldfield.—Electricity Committee. Recommended. Kiosk and switchgear (£463).—General Electric Co., Ltd.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, December 5th. Institution, London. 6 p.m. "Modern Developments in Railway Signalling." Major L. H. Peter.

South Midland Centre.—Friday, November 29th. Grand Hotel, Birmingham. 6.30 for 7 p.m. Annual dinner. Monday, December 2nd. James Watt Memorial Institute, Birmingham. 7 p.m. "Considerations in the Design of a High-Fidelity Radio-Gramophone." Mr. W. J. Brown.

Mersey & North Wales (Liverpool) Centre.—Monday, December 2nd. The University, Liverpool. 7 p.m. Papers on the Breakdown of Cables by Messrs L. G. Brazier and D. M. Robinson.

East Midland Sub-Centre.—Tuesday, December 3rd. The College, Loughborough. 6.45 p.m. "Circuit Interruption and Protection from Surges." Mr. F. H. Clough.

North-Western Centre.—Tuesday, December 3rd. Engineers' Club, Manchester. 7.15 p.m. "Recent Progress in Induction Motor Construction." Mr. L. H. A. Carr.

Wireless Section.—Tuesday, December 3rd. Institution, London. 6 p.m. "The Acoustical Design of Broadcasting Studios." Messrs. H. L. Kirke and A. B. Howe.

Meter & Instrument Section.—Friday, December 6th. Institution, London. 7 p.m. "The Measurement of Large Supplies of Electrical Energy for Costing Purposes." Messrs. W. Casson and A. H. Gray.

Hotel, Restaurant and Catering Exhibition.—Friday, November 29th, to Friday, December 6th. National Hall, Olympia, S.W.

Association of Supervising Electrical Engineers.—Monday, December 2nd. Royal Hotel, Bristol. 7.15 p.m. "Illumination—With Special Reference to Public and Industrial Buildings." Mr. W. J. Jones.

Electrical Power Engineers' Association (London Technical Group).—Monday, December 2nd. Caxton Hall, S.W.1. 7.15 p.m. "The Development and Possibilities of the Steam Turbine." Mr. H. L. Guy.

Institution of Engineers & Shipbuilders in Scotland.—Tuesday, December 3rd. 39, Elmbank Crescent, Glasgow. 7.30 p.m. "Electrification of Glasgow District Subway." Mr. W. R. Bruce.

Radio Manufacturers' Association.—Wednesday, December 4th. Grosvenor House, W.1. Annual dinner and ball.

Association of Mining Electrical Engineers (Kent Sub-Branch).—Saturday, December 7th. Technical Institute, Dover. 6.30 p.m. "Steam Winding v. Electrical Winding."

Notes

The E.A.W. Croydon Branch

The first anniversary luncheon of the Croydon and District Branch of the Electrical Association for Women was held at Grant's Restaurant, Croydon, on November 20th, Mrs. F. N. Rendell-Baker presiding. Among the guests were Sir Montague Hughman (chairman of Messrs. W. T. Henley's Telegraph Works Co., Ltd.), representing his wife (the president) who was absent owing to indisposition, the Mayor and Mayoress of Croydon, Mr. H. G. Williams, M.P., Miss C. Haslett (director, E.A.W.), Alderman Mrs. Bessie Roberts, and Mr. A. C. Cramb. In reply to Mrs. H. G. Williams, who proposed the toast of the Association, Miss Haslett outlined some of the recent activities of the E.A.W. Alderman Mrs. Bessie Roberts proposed the toast of the Croydon and District Branch, and Mrs. F. R. Thomas (vice-chairman), responding, gave a brief description of the Branch's lectures and visits during the past year. The toast of the visitors was proposed by Mrs. J. Cuthbertson, the Mayoress replying.

Mersey and North Wales I.E.E.

Sir Archibald Page, chairman of the Central Electricity Board, at the annual dinner of the Mersey and North Wales (Liverpool) Centre of the I.E.E., held at the Adelphi Hotel, Liverpool, on Monday night, described the Clarence Dock power station, Liverpool, as "one of the most prized assets in the grid scheme of things." It was in the way of being the most efficient station in the country, and it was not surprising that it had been found necessary to put large extensions in hand immediately. He congratulated all concerned—the city, Mr. P. J. Robinson, and all who were associated with him in securing for Liverpool its electrical pre-eminence. Replying to the toast of "The City and Trade of Liverpool," the Lord Mayor (Councillor R. J. Hall, J.P.) described how electricity had improved factory life. Great fields of opportunity were, however, still open to the electrical industry in Liverpool, as, for example, in the electrification of the railway terminals. Sir Frederick Marquis, in proposing "The I.E.E.," said what surprised him was the manner in which people took for granted all the benefits of electricity. He suggested that the director of Housing in Liverpool and the city electrical engineer should put their heads together to provide low priced factories and a cheap and abundant supply of electricity for industries such as those that were being established in the South of England.

Mr. J. M. Kennedy, Pres. I.E.E., said he thought the rate of progress of the electrical industry might be considerably accelerated in spite of the many difficulties confronting it. A campaign was afoot to electrify a million houses in the coming year. In the ordinary way the occupiers would be people who were in the best position to pay. Might not some of the householders be those not so favourably situated? Mr. B. Welbourn proposed the toasts of the guests, which was acknowledged by Prof. T. B. Abell, pro vice-Chanceller of the Liverpool University, and Mr. J. S. Peck. Mr. R. G. Devey proposed "The Chairman," and Mr. Oscar C. Waygood replied.

Relays for Railway Signalling

The seventh in the series of B.S. specifications for relays for railway signalling has just been issued as No. 635-1935, thermal-type time-element relays, which are intended to be used as auxiliary relays only, the coil being out of circuit on completion of the time intervals. The time delay between energisation of the relays and operation of the appropriate contacts is laid down as "at least 5 seconds at the maximum setting," and the voltage rating of the relays is limited to 30 V. The portions of the specification dealing with constructional details follow the general lines of previous specifications, but the performance requirements are special. Copies of this specification can be obtained on application to the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

Insulating Varnish

For the more arduous duties, and on heavy machinery, baking oil varnish is used, and a B.S. Specification for this was published in 1930. For lower priced machines which are not subjected to severe stresses, and in repair shops, air-drying insulating varnish has proved popular. For the latter a new B.S. specification, based on the E.R.A. report, recognises two types of air drying insulating varnish as (1) varnish with methylated spirit solvent and (2) varnish with non-alcoholic solvent. They must comply with the specified tests for percentage volatile matter, specific gravity, viscosity, drying time, electric strength in damp atmosphere, ageing and flash point. The methods of test are dealt with in appendices. Copies of this specification (No. 634-1935) can be obtained on application to the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

The Electrical Industries Ball

This year's ball given by the Electrical Industries Benevolent Association on Tuesday easily surpassed its predecessors in the numerical support it received. The number of tickets sold was 651, but more than 850 applications were received. Though 200 were thus turned empty away, the assembly seemed to comprise most people of eminence in the electrical world, including overseas engineers, among whom we noticed Mr. H. R. Harper, of the Victorian Electricity Commission, and Mr. G. H. Swingler, of Cape Town. A notable absentee was Sir Felix J. C. Pole, the president of the Association, who was unable to get back from the Continent in time. Lady Pole, however, took his place in collaboration with Mr. E. E. Sharp (chairman of the Executive Committee), but the informal nature of the proceedings would, no doubt, prevent the duties of the position from being onerous on the night itself, as the only toast was the loyal one, and there were no speeches.

Jack Payne's band provided the music, and Miss Bertha Wilmott, Miss Emmie Joyce and Mr. Norman Long entertained the company. In addition to these, a surprise item was again contributed by the songs of Mrs. E. E. Hoadley. The funds of the Association have been augmented to the extent of £3,675 by the President's appeal. During the evening a further sum of £32 was obtained by the sale of numbered programmes. A shopping prize to the value of £10 was presented by John Lewis Partnership, Ltd., for the winning programme number drawn by Mr. M. Gardner. The second and third prizes of £5 and £2, won by Miss Cox and Mrs. Beaumont, were given by an anonymous member of the Executive Committee. The usual "penny" collection yielded nearly £19, which cannot be related by arithmetical calculation to the number present. The efforts of the president, chairman and other members of the Committee, the hon. secretary (Mr. Justus Eck) and the executive officer (Mr. A. H. Seabrook) seem to have succeeded beyond their most optimistic anticipations. With twice last year's number present and all active enough to take the floor (including many who have retired from work) the ballroom of the Grosvenor was at times somewhat congested. At next year's ball, provisionally arranged for November 24th, it has been decided to provide for a thousand or more dancers by taking the ice-rink for the evening.

Appointments Vacant

Mains assistants in the drawing office of the Works and Building Directorate, Air Ministry.

Junior scientific officer in the Scientific Research Pool, Air Ministry.

Lecturer in the Department of Electrical Engineering, Sunderland Technical College.

High-tension distribution engineer for Liverpool Electricity Department.

(See our classified advertisements.)

Makers' Names Wanted

SWINDON electric clock.

BRYANT JUNIOR porcelain connector.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. **N. A. Collard,** who resigned his position as assistant general manager of the Brush Electrical Engineering Co., Ltd., in April last, and has since been representing the Aktiebolaget Ljungstroms Angturbin, of Stockholm, on special negotiations in this country, has now joined the staff of John Thompson Water Tube Boilers, Ltd., Wolverhampton. His appointment marks his return to the boiler-making industry, as Mr. Collard served a number of years with the Stirling Boiler Co., Ltd., under the late Mr. H. J. S. Mackay. Mr. Collard will be mainly concerned with the sales side of the John Thompson Co., where his wide experience of power station plant and equipment, and his contact with the electricity undertakings of the country over a long period should be of considerable value to the company.

[Howard Coster
Mr. N. A. Collard

Mr. J. Johnson Smith has been appointed London branch manager of Messrs. Johnson & Phillips, Ltd. He is a specialist in switchgear, transformers and static condensers. He served his apprenticeship with the York Corporation Electricity Department, and was for some time junior assistant in the Sunderland Corporation Electricity Department, afterwards returning to York as installation engineer. In 1920 he joined the staff of Messrs. F. & A. Parkinson, and was manager of their Glasgow branch, and later manager of the Manchester office of Messrs. Crompton Parkinson, Ltd. In 1930 he was transferred to the London office as engineer, dealing with special industrial electrification schemes and public supply. In 1933 he joined Messrs. Johnson & Phillips, Ltd., as senior sales engineer in their London office. Mr. Johnson Smith is a member of the Board of Control of the Association of Supervising Electrical Engineers. During the war he held a commission in the R.E. Signals.

[Haines
Mr. J. Johnson Smith

A visit was paid recently to this country by French electrical engineers wishing to inquire into what is being done in water heating, cooking and domestic development generally. During their stay they visited the showrooms of the Croydon Corporation Electricity Department. Our picture shows M. Bonnemort, French representative of Messrs. Geo. Bray & Co., Ltd.; M. Ruklin, chief domestic and industrial heating engineer, Cie Parisienne d'Electricité; M. Volant, domestic electric heating engineer of the same company, and M. Jacobi, industrial heating engineer, Est-Lumière, interested in Croydon's method of electric water heating.

French electrical engineers at the Croydon Electricity Department showrooms

Mr. H. T. Vaughton, whose portrait accompanies this note, was formerly a representative of Premier Electric Heaters, Ltd., and "M.K." Electric, Ltd., in Scotland. For the past three years he has been acting as a manufacturers' agent, and his agencies include those of Burnley Components, Ltd., the Mitchell Electric Co., and Wireohms, Ltd.

Mr. H. T. Vaughton

Col. Lord Herbert Scott has joined the board of the Westinghouse Brake & Signal Co., Ltd.

Mr. D. Rudd, B.Sc., A.M.I.E.E., author of the article on "Industrial Distribution," which appears on page 741, is a native of Birmingham. He was educated at the Handsworth Grammar School and received technical tuition at Birmingham University, where he graduated in 1925. After a period with the Corporation Electricity Supply Department he was appointed, in 1930, to the staff of Messrs. George Ellison, Ltd., and he is now attached to their London office.

Mr. A. P. Newall, M.I.Mech.E., has been appointed managing director of Messrs. Edward Macbean & Co., Ltd., in succession to Mr. A. B. Carr.

Sir Percival Bower has been re-elected chairman of the Birmingham Corporation Electric Supply Committee.

Mr. R. G. Flanagan, Yorkshire representative of Carron Company, informs us of his engagement to Miss Dorothy Polden, daughter of Mr. Francis C. Polden, C.C., of Messrs. Francis Polden & Co., Ltd.

Sir Alexander Roger, chairman of British Insulated Cables, Ltd., and the Anglo-Portuguese Telephone Co., and **Mr. F. Kerr,** deputy-chairman of the Anglo-Portuguese Telephone Co., were received in Lisbon last week by Senor Salazar, Prime Minister and Minister of Finance of Portugal.

Mr. G. Kelsall, who has been for several years on the staff of Messrs. Barnett & Soans, Ltd., has been appointed electrical inspector by the Stoke-on-Trent Corporation Electricity Department.

Mr. F. O. Harber, who, as we reported in our last issue, has been appointed electrical engineer to the Portland Urban District Council, is at present mains superintendent with the Aylesbury Corporation Electricity Department. He received his technical training at Birmingham Technical College, and later was with a Birmingham firm of lift engineers. He has previously held appointments as chief electrical assistant to a consulting engineer and with the Metropolitan-Vickers Electrical Co., Ltd. Mr. Harber, who is an A.M.I.E.E., and an Associate of the American I.E.E., takes up his new duties on January 1st next.

Mr. F. O. Harber

Mr. T. Owen has retired after forty-one years service with the Mains Department of the Manchester Corporation Electricity Department.

Councillor H. L. Kirby Johnson, managing director of the Martindale Electric Co., Ltd., has again been elected chairman of the Estates, Parks and Allotments Committee of the Hendon Borough Council, with a seat on the Finance and General Purposes Committee.

Mr. W. Murray Morrison, vice-chairman of the British Aluminium Co., Ltd., who has been very prominent in the development of the aluminium industry in Great Britain, was on Wednesday presented with his portrait, painted by Mr. Gerald Kelly, R.A., together with an illuminated album signed by 426 colleagues and business associates. The presentation marked the completion by Mr. Murray Morrison of forty years with the British Aluminium Co., and was made by Major R. W. Cooper, chairman of the company, at a gathering of directors, staff and friends.

Obituary

Lady Salomons.—The death occurred at Broom Hill, Tunbridge Wells, on Saturday last of Lady Salomons, widow of Sir David Salomons, Bt., who figured very prominently in electric lighting and other electrical affairs in the City between thirty and forty years ago; was assiduous as an electrical inventor and experimenter at Tunbridge Wells; and whose large collection of scientific apparatus was presented to Cambridge University by Lady Salomons after his death.

Mr. F. Seary.—Mr. F. Seary, who died at Newport (Mon) last week at the age of seventy-seven, went to Newport from Oxford forty-five years ago to work for Messrs. A. G. Arnold, electrical engineers, and was later appointed manager and chief electrical engineer to that firm.

Mr. H. Kennish.—The death occurred on November 11th, at the age of seventy-seven years, of Mr. Henry Kennish, of Ramsey, who was for over thirty years an engineer with the Manx Electric Co. He retired five years ago.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Ray Electric, Ltd.—Private company. Registered November 18th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in electrical and mechanical apparatus and accessories, electric signs and all apparatus appertaining thereto, refrigerators, wireless sets, &c. The directors are: P. B. and A. C. Roberts, Tatham Rectory, Wennington, near Lancaster, and another. Registered office: 54a, Market Street, Lancaster.

Idealite, Ltd.—Private company. Registered November 18th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and factors of and dealers in all classes of electric and gas lighting fittings and their requisites in iron and non-ferrous metals, wood, glass, composition and other substances, mechanical, electrical and general engineers, &c. The first directors are: H. F. Foster, 46, Showell Road, Bushbury, Wolverhampton, and V. M. Benson, 8, Kenilworth Place, Francis Road, Edgbaston, Birmingham. Secretary: H. F. Foster. Registered office: 113, Edmund Street, Birmingham.

Corporation of Electric Transport, Ltd.—Private company. Registered November 19th. Nominal capital, £22,000 in 20,000 6 per cent. cumulative preference shares of £1 each and 40,000 ordinary shares of 1s. each. Objects: To carry on business as salesmen and distributors of electric vehicles and equipment, electrical engineers and contractors, manufacturers of and dealers in electric, galvanic and other apparatus, motor manufacturers, engineers and dealers, aircraft and wireless manufacturers and dealers, &c. The subscribers are: H. N. Weller, "Hill Dene," Chipstead Way, Woodmansterne, Banstead, Surrey, and A. R. Hancock, 13, Royal Terrace, Kennington, London, S.E.17. Secretary: B. J. Davis. The registered office is at 2, Norfolk Street, Strand, London, W.C.2.

McCall & Co. (Warrington), Ltd.—Private company. Registered November 20th. Capital, £1,000 in £1 shares. Objects: To acquire the business of electric fittings dealers, wireless dealers and electricians carried on by S. Smith and P. McCall at Wilderspool Causeway, Warrington, Lancs, as "McCall & Company." The permanent directors are: S. Smith, 6, Warren Drive, Appleton, Ches, and two others. Registered office: 228, Wilderspool Causeway, Warrington.

Tool B.B. Co., Ltd.—Private company. Registered November 21st. Capital, £1,000 in £1 shares. Objects: To acquire the business of makers in moulds, general engineers, &c., carried on by R. H. Bacciarelli, V. A. Bacciarelli & C. Bishop, as "Tool B.B. Company," at 10, William Street, Hampstead Road, N.W.1, and to carry on the business of makers of moulds for bakelite and all synthetic resins and all casein materials, die castings, press tools, &c. S. V. Bacciarelli, 67, Anson Road, N.7, is secretary. P. Bacciarelli is to be managing director and chairman so long as he holds £100 shares. Registered office: 10, William Street, Hampstead Road, N.W.1.

Brookford Manufacturing & Patents Co., Ltd.—Private company. Registered November 21st. Capital, £1,200 in 2,000 cumulative participating preference shares of 10s. and 4,000 ordinary shares of 1s. Objects: To carry on the business of bakelite moulders, mechanical engineers, ironfounders, &c. The directors are: C. H. A. Edye, 1, Killieser Avenue, S.W.2, and A. C. Brooks. Address not stated.

Arthur T. Costigan, Ltd.—Private company. Registered November 20th. Capital, £500 in £1 shares. Objects: To acquire the business of an electrical contractor and engineer and dealer in wireless goods lately carried on by A. T. Costigan at 331, Birchfield Road, Birchfield, Birmingham. The directors are: A. T. Costigan and Mrs. Edith A. Costigan, 331, Birchfield Road, Perry Barr. Registered office: 331, Birchfield Road, Birmingham.

Archer Electric, Ltd.—Private company. Registered November 18th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical appliances and apparatus of all kinds, &c. The directors are: W. H. Archer, 70, Lambton Road, London, S.W.20, and W. H. Johnstone, A.C.A., 9, Sloane Gate Mansions, London, S.W.1. Secretary: W. H. Johnstone, A.C.A. Registered office: 21/22, Bedford Row, London, W.C.1.

Shipley Radio Relays, Ltd.—Private company. Registered November 8th. Capital, £3,000 in £1 shares. Objects: To carry on the business of radio and television relayers, electricians, &c. The subscribers are: S. Lewis, 40, Crawthew Grove, East Dulwich, London, S.E.22, and F. J. Hammond, 108, Hungerford Road, Holloway, London, N.7. Solicitors: Burr, Sugden & Co., Stone House, Bishopsgate, E.C.

Returns of Electrical Companies

Gosport & Alverstoke Electric Lighting Co., Ltd.—Capital, £35,000 in £10 shares. Return dated June 3rd, 1935. 2,500 shares taken up. £25,000 paid. Mortgages and charges, nil.

Shoreham & District Electric Lighting & Power Co., Ltd.—Capital, £100,000 in £1 shares (increased from £75,000 on October 23rd, 1935). Return dated July 17th, 1935. All shares taken up. £68,500 paid, £6,500 considered as paid. Mortgages and charges, nil.

Frinton-on-Sea & District Electric Light & Power Co., Ltd.—Capital, £50,000 in 7,300 preference and 42,700 ordinary shares of £1. Return dated July 17th, 1935. All shares taken up. £50,000 paid. Mortgages and charges, nil.

Earlco (Electrical Services), Ltd.—Capital, £4,000 in £1 shares. Return dated July 5th, 1935. 2,722 shares taken up. £1,522 paid, £1,200 considered as paid. Mortgages and charges, nil.

Frank Wall & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated July 24th, 1935. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Maitland & Co. (Manchester), Ltd.—Capital, £3,000 in £1 shares. Return dated July 8 (filed October 17th), 1935. All shares taken up. £2 paid, £2,998 considered as paid. Mortgages and charges, nil.

Johnson & Turner, Ltd.—Capital, £2,000 in £1 shares. Return dated July 18th, 1935. 1,000 shares taken up. £700 paid, £300 considered as paid. Mortgages and charges, nil.

Batterylife, Ltd.—A. Rosenberg, 4, Paradise Square, Sheffield, ceased to act as receiver and/or manager on November 15th, 1935.

R. Marshall Carr, Ltd.—Charge on 96, Mill Street, Macclesfield, &c., dated November 13th, 1935, to secure £840 and any other moneys that now are or may hereafter become due from the company to the Cheshire Building Society, Castle Street, Macclesfield.

Electronic & Television Industries, Ltd.—Private company. Registered November 23rd. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio apparatus, radio-gramophones, sound reproducing machines, &c. The directors are: H. B. Schofield (permanent), address not stated, and G. T. Baldock, 45, Bloomsbury Square, W.C.1. Solicitors: Warren Murton Foster & Swan, 45, Bloomsbury Square, W.C.1.

W. T. Glover & Co., Ltd.—The nominal capital has been increased by the addition of £285,150 in £1 ordinary shares beyond the registered capital of £214,850.

S. P. Catterson & Sons, Ltd. (old company).—Satisfaction (a) to the extent of £9,500 on May 9th, 1935, of "A" debentures authorised by resolutions of August 31st, 1893, October 3rd, 1933, and September 4th, 1934, and registered April 5th, 1935, October 10th, 1933, and September 17th, 1934, respectively, and (b) to the extent of £3,500 on October 17th, 1935, of "Z" debentures authorised September 4th, 1934, and registered September 19th, 1934. (Notices filed November 15th, 1935.)

Wickford & District Electricity Supply Co., Ltd.—Capital, £30,000 in 28,500 ordinary and 1,500 preference shares of £1. Return dated March 26th (filed October 18th), 1935. 16,500 ordinary and 1,500 preference shares taken up. £17,895 paid, £5 considered as paid. Mortgages and charges, nil.

Lewes & District Electric Supply Co., Ltd.—Capital, £60,000 in £1 shares. Return dated May 14th (filed July 1st), 1935. 57,500 ordinary shares taken up. £57,500 paid. Mortgages and charges, nil.

Buckrose Light & Power Co., Ltd.—Capital, £100,000 in £1 shares (increased from £50,000 on October 23rd, 1935). Return dated June 25th, 1935. 50,000 shares taken up. £50,000 paid. Mortgages and charges, nil.

J. C. White & Co., Ltd.—Capital, £10,000 in £1 shares. Return dated June 28th, 1935. 10,000 shares taken up. £2 paid, £9,998 considered as paid. Mortgages and charges: £3,288 1s. 9d. (overdraft at June 28th, 1935), secured by debenture.

Birmingham Electric Furnaces, Ltd.—Capital, £1,000 in £1 shares. Return dated July 23rd, 1935. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Wholesale Electric Co., Ltd.—Capital, £1,500 in £1 shares. Return dated July 19th, 1935. All shares taken up. £1,500 paid. Mortgages and charges, nil.

City Notes

Crompton Parkinson, Ltd., will hold their twenty-second annual meeting at Bush House, W.C.2, on Friday, December 13th. One of the resolutions to come before the meeting will provide for £16,890 10s. (part of the reserve funds) to be capitalised and set free for distribution among the members free of income tax. It will not be paid in cash but will be applied in paying up in full 67,562 "A" ordinary shares of 5s. each, such shares to be credited as fully paid up to the persons who are registered as the holders of the ordinary and "A" ordinary shares on December 31st, 1935, or their nominees, at the rate of seven new fully paid "A" ordinary shares for every hundred shares (ordinary and/or "A" ordinary) held, such new "A" ordinary shares to rank for dividend as from October 1st, 1935, and in other respects *pari passu* with the existing issued "A" ordinary shares. All shareholders are invited to the meeting, but only holders of ordinary shares may vote in the circumstances at present obtaining. The directors are: Messrs. F. Parkinson, chairman and joint managing director, A. Parkinson, joint managing director, C. Cooper, E. J. Fox, E. C. Holroyde, and Col. R. E. Crompton.

In their report for the year ended September 30th, 1935, the directors show that the net profit for the period after providing for depreciation, directors' fees, &c., is £243,810 (against £131,809). £57,311 was brought forward (against £50,618 in the previous year), leaving £301,121 (against £182,427). The dividend of 4 per cent. on the 8 per cent. first preference shares for the six months ended March 31st, paid in June, absorbed £6,829; 3 per cent. on the 6 per cent. second preference for six months absorbed £15,000, and the interim dividend at the rate of 6 per cent. actual on the ordinary and "A" ordinary shares paid in June £13,972, leaving £265,320 (against £148,013 for 1933-34). It is proposed to dispose of this balance in the following ways:—Transfer to general reserve, £154,377 (against £55,234); to central benevolent fund, £10,000; 4 per cent. on the first preference shares for six months, £6,829); 3 per cent. on the second preference shares for six months, £15,000; and a final dividend on the ordinary and "A" ordinary shares of 6½ per cent. actual, making, with the interim dividend, a distribution at the rate of 12½ per cent. for the year, requiring £15,684 (against £13,639), leaving a balance to be carried forward of £63,430 (against £57,311). As stated in the above resolution, it is proposed to capitalise the sum of £16,890 10s., being part of the general reserve, to enable a distribution to be made by way of bonus.

We have received an advance copy of the speech which Mr. Frank Parkinson will deliver at the annual meeting. Mr. Parkinson says that the net profits represent a considerable advance on the best year the company has ever had. Amongst the contributory causes of the expansion in profits are the following:—(1) The company is now beginning to realise some of the benefits of the rationalisation policy carried out within the group organisation in recent years. (2) All branches have been fully employed during the year and are supplying an increased demand from both home and overseas markets. (3) The improved co-operation within the electrical manufacturing industry itself has been maintained satisfactorily. There is a still stronger ground for confidence in the fact that the company's growth has been founded on distinctive ideas which will merit a still larger demand for its products and possibly the extension of its activities into other fields as opportunity occurs. The sales of Crompton & Kye lamps are up by more than 20 per cent. on last year. The range of lamp manufacturing is being steadily extended and the company has under consideration the erection of large new works to enable it to extend its activities in directions where its experience and the market possibilities justify such extensions. Referring to the litigation which has been instituted against the company by members of E.L.M.A. in this country and "Phoebus" abroad for alleged infringement of lamp patents, Mr. Parkinson says that the whole of the cost of the actions up to date has been borne out of revenue, and substantial reserves have been created in respect of contingencies, in the event of the company losing the actions, or any of them. The subsidiary, Atlas Sprinkler Co., Ltd., has secured a number of important contracts for the installation of fire protection equipment during the year. Hitherto it has confined its activities in this direction to the home market, but in the future it contemplates using its world-wide connections to build up an overseas business in fire protection equipment. With regard to railway electrification, during the past few years the company has carried out a number of electric traction contracts and with the experience and reputation gained on these contracts it is favourably placed to secure a fair proportion of the business resulting from any such development. It has just secured an important contract for new railway electrification equipment for the L.N.E.R. in connection with the Tyneside scheme. During the year the buildings and plant at Derby of Derby Cables, Ltd., have been extended to enable them to deal with the continuously expanding demand for paper and rubber cables, and the considerable increase in demand in overseas markets will probably necessitate further extensions in the near future. The superannuation and benevolent funds have been extended to include the eligible employés in all the subsidiary and associated companies.

At an extraordinary meeting which will follow the annual meeting, resolutions will be submitted for increasing the capital of the company from £1,000,000 to £1,500,000 by the creation of a further 2,000,000 "A" ordinary shares of 5s. each, ranking *pari passu* with the existing "A" ordinary shares. It is proposed further to capitalise £241,294 of the reserves and distribute it amongst the ordinary and "A" ordinary shareholders in 965,176 new fully paid "A" ordinary shares of 5s., representing a share-for-share capital bonus.

British Electric Transformer Co., Ltd.—In their report for the period ended September 30th, 1935, the directors state that the net profit for the year after providing for depreciation, &c., is £47,342, plus £1,297 brought forward, making £48,639. The interim dividend at the rate of 8s. 9d. per share, free of tax on the ordinary shares, paid in September, absorbed £17,500; the 5 per cent. preference dividend for the year will require £9,531; and it is proposed to pay a final dividend on the ordinary shares of 10s. per share, free of tax (£20,000), leaving to be carried forward £1,608. The transformer business continues to be satisfactory. The increase in the sales of Kye electric lamps has again been considerable and has contributed to an appreciable extent to the increased earnings in the year.

The issued capital of the company is: 40,000 ordinary shares of 5s. each fully paid (£10,000); and 190,625 5 per cent. £1 preference shares guaranteed by Crompton Parkinson, Ltd. (£190,625).

S. Smith & Sons (Motor Accessories), Ltd., held its annual meeting on November 21st, when Mr. Walter Henderson Cleland (chairman), who presided, said that business had again substantially increased. The K.L.G. Sparking Plug Co. had maintained its position during the year, while K.L.G. France, only established eighteen months ago, was doing a large and profitable business. The demand for British clocks was expanding and the All-British Escapement Co. & Smith's English Clocks showed increased business. The turnover of the Smith group of subsidiaries was now approaching that of the parent company and making a valuable contribution to its profits. The chairman, in referring to the current year's prospects, said that in the first three months the turnover of the parent company and its subsidiaries had shown a further increase, and the increasing demand had rendered necessary further extensions and new factories were in course of erection.

Edmondson's Electricity Corporation, Ltd.—The lists were to be opened yesterday for the sale of £2,000,000 3½ per cent. debenture stock at £98½ per cent. The stock will rank *pari passu* in point of security with the 4 per cent. debenture stock. Redemption will be by a cumulative sinking fund to provide for complete redemption by December 30th, 1980. From December 30th, 1950, the company will have the right to repay the stock on three months' notice. It will constitute a first floating charge on the undertaking and all the assets of the company, both present and future, including uncalled capital. The purpose of the issue is to provide moneys required for financing the development of subsidiary and associated undertakings and for the repayment of temporary loans.

R. A. Lister & Co., Ltd., announce a profit for the year ended September 30th of £112,678 (an increase of £31,809), out of which £22,522 is placed to taxation reserve, £14,329 to directors' commissions and staff bonus, £10,000 to pension reserve, and £15,000 to general reserve. The preference dividend takes £13,950 and the ordinary dividend for the year is 10 per cent. (against 7½ per cent.) on capital increased by a 25 per cent. share bonus last year. This leaves a balance to be carried forward of £58,805 as compared with £50,991 for 1933-34. The directors have decided to raise additional capital to finance the expanding business by offering to ordinary shareholders 37,500 new ordinary £1 shares at 35s. per share in the proportion of one for every ten held on November 30th.

The North Metropolitan Electric Power Supply Co. has instructed its brokers to sell an issue of £625,000 3½ per cent. debenture stock ranking *pari passu*, except as to rate of interest and terms of redemption, with the existing 4 per cent. debenture stock. This stock is secured by a floating charge on the whole undertaking and property of the company, including uncalled capital.

Tube Investments, Ltd., report a profit for the year ended October 31st last of £502,784 against £371,370 for 1933-34. From this are deducted directors' fees, interest and capital increase expenses, leaving £493,863, to which is added £106,119 brought in, making £599,982. The ordinary dividend is 10 per cent., less tax (same), and the liaison and ordinary shares receive the same rate relatively as the former, leaving £107,276 to be carried forward. The report states that the progress of the business once again permits capitalisation of a part of the reserve and its distribution among ordinary and liaison ordinary shareholders in the proportion of 1 in 10 and 1,000 in 10 respectively.

Vactric, Ltd.—Presiding at the annual meeting on November 26th, Mr. S. Kingsley Tubbs (chairman) said that throughout the year under review sales had continued to expand. Recent alterations and extensions to the factory had enabled them to cope with the rising demand, and if the turnover increased more rapidly than was anticipated still further factory space would become necessary.

The East African Power & Lighting Co. has announced an interim dividend of 3 per cent., less tax, on the ordinary shares.

Altringham Electric Supply, Ltd., has declared interim dividends of 3s.-9 3/5d. on the participating ordinary shares and 1s. 3 6/7d. on deferred shares, less tax.

The Southern Areas Electric Corporation is maintaining its interim dividend at 1½ per cent.

Stocks and Shares

TUESDAY EVENING.

THE Stock Exchange markets have settled down into quieter conditions than those which prevailed at the time of the General Election. The effect of the National Government's return to power has been beneficial to investment stocks, and, in various directions, to the shares of industrial companies. Business as a whole is what the Stock Exchange member calls "spotty"; that is to say, some men and some markets are very busy, while others find comparatively little occupation for their energies. There continues to be a good demand for shares in most of the companies connected with electrical manufacturing and equipment. Elsewhere, Cable and Wireless issues have attracted, and are still attracting, favourable interest. American utilities are well to the fore, and at rising prices.

Gilt-edged Stocks

Investment keeps a watchful eye upon the possibility of national borrowing on a substantial scale for the purposes already outlined by the previous Government. The extensive electrification of railways, and the energetic development of other industries calculated to increase employment in, more

particularly, the distressed areas, have had, so far, but little effect upon prices in the purely gilt-edged groups. Such stocks as those of the Electricity Boards are holding their strength. Central Electricity 5 per cent. stock of 1955-75 is a point higher at 118. The 3½ per cent. stock of 1963-93 is now offered at under 103, ex the interest due on Monday next. At this the flat rate of return is £3 7s. 6d. per cent. the redemption yield 3¼ per cent. The middle price of the stock, as our lists show, is 102. London Passenger Transport "A" and "B" stocks hold the rises that they secured last week, and the "C" stock, after a rise to 106½, reacted to 105¼.

Electricity Supply

A few rises of 6d. apiece, and a fall of 1s. in Metropolitans, are the only changes that mark our list of electricity supply shares. The improvements can be counted on fewer fingers than one hand controls. The general tendency of the market is taking its cue from that in other investment departments. London Associated units keep about 34s. 6d.; this reflects the disposition of the market as a whole. Inquiry for Chiswick Electric ordinary found no shares to be available. West Devon ordinary have eased off to 26s.

Perak Electrics have attracted business on the basis of 19s. 6d. British Power and Light shed a few pence to 29s. 9d. Calcutta Electric ordinary are steady at 3¼. East African Electrics hardened to 34s. 9d.

Cable and Wireless

Bullish anticipation of a good index-figure for last month from Cable and Wireless turned out to be fully warranted. The traffic return came up to the best forecasts. As past experience has abundantly testified, such fulfilment serves to tempt selling for account of people who had bought in advance. Cable "A" rose to 30, but quickly went back to 29. The 5½ per cent. preference stock at 106 is up a point. The "B" ordinary at 9 is 5s. lower. Globe ordinary shares, after their jump of 1½, lost half a sovereign, the price going back to 15¼. Other telegraph and telephone issues are mainly good. Anglo-American preferred and deferred, and Great Northerns, have gone ahead. Anglo-Portuguese ordinary are quoted ex rights at 30s.

Crompton Parkinsons

Seldom does it happen that market gossip comes so close to the actual event as in the case of the Crompton Parkinson announcement. The rumours were set out here last week, and the official declaration was in terms almost identical. A share-for-share bonus, accompanied by a repetition of the previous 7 per cent. share bonus, accompanied the recommendation of a cash dividend of 12½ per cent. The company's profit figures show an impressive increase. That the directors view the future with quiet confidence, their statement implies. The price of the shares rose from 95s. to 102s., went back to the former figure upon profit-taking after the declaration, and then rallied to £5. After the rearrangement of capital, the value of the shares, ex everything, will be divided by two, as the number of shares is to be doubled.

Activity in Americans

The American market is characterised by good prices and bustling animation. Evidently bearing in mind the next Presidential Election, a Washington spokesman was at pains a few days ago to explain that the present administration desired to create no disturbance in the progress of United States business. Wall Street seized upon the statement as a lever with which to raise prices. American Telephone and Telegraph went up 8 to 160½. Internationals rose 2, to 14, but came back to 13. Canadian utilities strengthened as a further tribute to the belief that the new trade pact between Canada and the United States will certainly advantage the former. Some of the United States critics agree, rather wryly, with this view.

Manufacturing and Equipment

The market for shares in the manufacturing and equipment companies aptly reflects by its strength the optimism expressed at the B.E.A.M.A. dinner held on Thursday last week by those acquainted with the way in which the industry is going ahead. Henleys have risen to 7⅛, General Electrics to 71s., Electric Constructions to 32s. Enfields are better at 5¼. The many gains in this section, shown in last week's record, have been fully retained with the exception of that in Johnson & Phillips. Here, the price fell back 9d. in consequence of the strike that occurred amongst the employés at the company's Charlton works. English Electric are better.

Miscellaneous Matters

As usual, the spectacular movement of the week's fluctuations is left to British Electric Traction deferred stock. The price is a round hundred points up, at 1315. Traction stocks in other countries are less in favour. Brazilian Tractions put on a point. On Montreal and Brussels buying, the shares rose to 10¼. Then a revolution in Brazil was reported, and back went the price to 9¼. Mexican issues are dull: the 7 per cent. preferred shares of Mexican Light & Power at 3 are 1½ lower.

Iron, coal and steel shares have been somewhat overshadowed by the position in the coal trade. Prices keep tolerably steady, but there is nothing like the rush to buy shares that last month witnessed. Perhaps the slowing-down of exuberance is not a bad thing for a market in which the previous pace had been very fast.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend 1933.	Dividend 1934.	Price Nov. 26.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	3¾	—	3 17 5
City of London	1	7½	7½	37/-	—	4 1 0
Clyde Valley	1	7	8	43/6	—	3 13 7
County of London	1	10½	10½	55/-	—	3 16 4
Edmundson's 7% Pref.	1	7	7	36/-	—	3 17 9
Do. Ord.	1	7	8	43/6	+6d.	3 13 5
Elec. Dis. Yorkshire	1	9	9	46/6	+6d.	3 17 5
Elec. Fin. and Securities	1	12½	12½	3⅛	—	3 12 9
Elec. Supply Corporation	1	11	11	3½	—	3 10 3
Lancs Light and Power	1	7½	7½	38/6	—	3 18 0
Lond. Assoc. Electric	1	—	—	34/6	—	4 1 2
London Electric	1	7	8	39/-	—	4 2 0
London Power deb. Red.	Stock	5	5	108½	—	4 12 4
Metropolitan	1	10	10	52/-	−1/-	3 17 0
Midland Counties	1	7	7	38/-	—	3 13 9
Mid. Elec. Power	1	8	8	41/3	—	3 17 6
North Eastern Electric Ordinary	1	6	6	34/-	—	3 10 7
Do. 7% Pref.	1	7	7	35/-	—	4 0 0
Northampton	1	10	10	52/6	—	3 16 3
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary	1	10	10	57/6	—	3 9 5
Do. do. 6% Pref.	1	6	6	32/-	—	3 15 0
Scottish Power	1	8	8	42/6	—	3 15 3
South London	1	7	7	34/-	—	4 2 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	25/6	—	5 17 8
Yorkshire Elec.	1	8	8	44/6	—	3 12 0

PUBLIC BOARDS.

Central Electricity, 1950–70	Stock	5	5	115	—	4 7 0
Do. 1955–75	,,	5	5	118	+1	4 4 9
Do. 1951–73	,,	4½	4½	112	—	4 0 4
Do. 1963–93	,,	—	3½	102	—	3 8 8
London Elec. Trans. Gtd.	,,	—	2½	97	—	2 11 8
London & Home Counties, 1955–75	,,	4½	4½	114	—	3 19 0
London Passenger Transport, A	,,	—	4½	122½	—	3 13 8
Do. do. B	,,	—	5	128½	—	3 17 10
Do. do. C	,,	3½	4	105½	−½	3 15 10
West Midlands Joint Elec. 1948–68	,,	—	5	115	—	4 7 0

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$100	9	9	160½	+8	5 12 2
Anglo-Am. Tel. Pref.	Stock	6	6	120	+1	5 0 0
Do. Def.	,,	1½	1½	29½	+1	5 1 8
Cable & Wireless 5½% Pref.	,,	2¾	4½	106	+1	3 17 7
Do. A. 7½% Ord.	,,	Nil	Nil	29	−½	—
Do. B. Ord.	,,	Nil	Nil	9	−½	—
Globe Tel. & Tel. Ord.	10	2½	3½*	15½	−½	2 6 0
Do. do. Pref.	10	6	6	14	—	4 5 9
Great Northern Tel.	10	20	20	40	+1	5 0 0
Marconi-Marine	1	10	7½	37/6	—	4 0 0
Oriental Telephone Ord.	1	12	12	3⅛	—	*3 18 4

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	9d.	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	,,	5	5	1315	+100	—
Do. do. Pref. Ord.	,,	8	8	168	—	4 15 3
Brazil Traction	100	—	—	9¼	+1	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	98½	−1	5 1 6
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	3	−1½	—
Do. 1st Bonds	$500	5	5	40	—	—
Victoria Falls Ord.	1	20	20	3½	—	—
West Riding	1	5	6½	46/3	—	2 16 9

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	15	60/-	—	5 0 0
Assoc. Elec. Ord.	1	4	6	40/-	—	3 0 0
Do. Pref.	1	8	8	37/-	—	4 6 0
Babcock & Wilcox	1	6	8	52/6	—	3 1 0
British Aluminium Ord.	1	5	7½	43/6	—	3 9 0
British Insulated Ord.	1	5	15	4½	—	3 5 0
Brush Ord.	Stock	Nil	Nil	51	—	—
Callender's	1	15	15	3⅜	—	3 18 9
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/-	—	12½	5	+½	0 12 6
Do. 8% Pref.	1	8	8	36/3	—	4 8 4
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	3½	32/0	+1/3	2 3 10
Enfield Cable Ord.	1	25	25	5½	+¼	4 15 5
English Electric	1	Nil	Nil	19/-	+6d.	—
Do. do. Pref.	1	Nil	Nil	22/6	—	—
Ericssons Tel.	5/-	—	24	32/6	—	—
Ever Ready	5/-	35	35	24/-	—	7 5 10
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	33/6	+6d.	3 18 9
Do. Ord.	1	8	10	71/-	+2/-	2 16 4
Henley's	1	30	30	7⅛	+⅛	4 5 0
Do. 4½% Pref.	5	4½	4½	5½	—	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	48/9	−9d.	3 1 7
Siemens Ord.	1	6½	4	25/-	—	3 4 1
Telegraph Construction	£1	Nil	Nil	25/-	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1934

5587. "Electrical direct-current systems." B. C. Von Platen. February 22nd, 1933. (437366.)
6055. "Automatic tuning devices for radio receivers." H. Jackson. February 24th, 1934. (437442.)
6113. "Magnetos." Scintilla Magneto Co., Inc. February 25th, 1933. (437362.)
6655. "Detectors for television signals." Radioakt-Ges. D. S. Loewe. March 2nd, 1933. (437643.)
9052. "Arrangements in automatic telephone plants." Telefonaktiebolaget L. M. Ericsson. March 23rd, 1933. (437591.)
9474. "Cathode-ray tubes." L. F. Broadway and W. F. Tedham. March 26th, 1934. (437594.)
10227. "Telegraph systems." Western Union Telegraph Co. April 13th, 1933. (437646.)
10429. "Electric lighting fittings." A. H. Curtis. April 8th, 1935. (437367.)
12149. "Electric signs." Strand & Interchangeable Signs, Ltd., and F. A. Andrews. April 23rd, 1934. (437369.)
12175. "Means for regulating heat exchange, for example, in cooling arrangements for electric-discharge devices." General Electric Co., Ltd., and E. Gallizia. April 23rd, 1934. (437371.)
12671. "Voltage multiplying and rectifying arrangements." Marconi's Wireless Telegraph Co., Ltd. April 26th, 1933. (437520.)
12730. "Television systems." Communication Patents, Inc. June 21st, 1933. (437602.)
12820. "Electrodynamic sound reproducers or microphones." S. L. Price and J. E. G. Parritt. April 27th, 1934. (437605.)
13286. "Mercury electric cut-outs." British Thomson-Houston Co., Ltd., G. S. C. Lucas, and C. G. Mayo. May 2nd, 1934. (437650.)
13307. "Electric signalling systems particularly for train-describing purposes." R. Mordin and Westinghouse Brake & Signal Co., Ltd. May 2nd, 1934. (437654.)
13375. "Scanning apparatus for television and the like." Electrical Research Products, Inc. May 24th, 1933. (437656.)
13417. "Flameproof or explosion-proof enclosures for electric switchgear and similar purposes." H. T. Baldwin. May 3rd, 1934. (437387.)
13435. "Gas or vapour electric-discharge devices." Electrical Equipment & Carbon Co., Ltd. (Elin Akt.-Ges. für Elektrische Industrie). May 3rd. 1934. (437660.)
13446. "Electric cables." W. T. Henley's Telegraph Works Co., Ltd., and J. H. Savage. May 3rd, 1934. (437455.)
13464. "Electric cables." Macintosh Cable Co., Ltd., and A. Sargent. May 4th, 1934. (437525.)
13539. "Conversion of alternating currents." B. C. Von Platen. July 12th, 1933. (437669.)
13557. "Thermionic oscillation generators." Marconi's Wireless Telegraph Co., Ltd., and W. B. Mouillin. May 4th, 1934. (437671.)
13558. "Supply circuit arrangements for photo-electric cells and like low-current consuming devices." Marconi's Wireless Telegraph Co., Ltd., and J. Stewart. May 4th, 1934. (437672.)
13566. "Excess-current circuit-breakers." Soc. Francaise Gardy, and M. Clusel. May 4th, 1933. (437673.)
13596. "Electron-discharge tubes." Allgemeine Elektricitats-Ges. May 4th, 1933. (437529.)
13692. "Portable electric battery lamps." J. Davis & Son (Derby), Ltd., and W. Grafton. May 7th, 1934. (437389.)
14063. "Radio receiving systems and circuits and apparatus therefor." D. W. Pugh and Baird Television, Ltd. May 9th, 1934. (Cognate application 25118/34.) (437460.)
16017. "Electro-magnetic contactors." Allmanna Svenska Elektriska Aktiebolaget. August 19th, 1933. (437679.)
16584. "Pneumatically operated electric switches." A. West & Co., Ltd., C. Johnson, and W. J. Paddock. June 4th, 1934. (437462.)
16727. "Galvanic battery." A. G. L. Pennock and S. Lee. June 5th, 1934. (Cognate applications 18410/34, 20931/34, and 23545/34.) (437536.)
17515. "Wireless receiving systems." A. C. Cossor, Ltd., and R. Pollock. June 13th, 1934. (437538.)
18033. "Signalling systems wherein the signals are formed by electrical impulses." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, and R. Barthelemy. January 18th, 1934. (437539.)
19097. "Electrical signalling and time recording systems and apparatus." Ericsson Telephones, Ltd., and C. W. Wilman. June 28th, 1934. (437621.)
19178. "Electric-discharge devices." H. Akroyd. June 29th, 1934. (437686.)
21027. "Joints for electric cables." C. J. Beaver, E. L. Davey, and W. T. Glover & Co., Ltd. July 18th, 1934. (437468.)
22309. "Sockets used for electrical connections." L. H. Reid. July 31st, 1934. (437546.)
22351. "Signalling systems wherein the signals are formed by electrical impulses." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. September 27th, 1933. (437547.)
22494. "Electric-arc welding devices." A. J. Rivett-Carnac, and Associated Electrical Industries, Ltd. August 1st, 1934. (437470.)
23170. "Electric ship propulsion." British Thomson-Houston Co., Ltd. August 10th. 1933. (437398.)
23543. "Electric discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). August 15th, 1934. (437549.)
23755. "Cathode-ray tubes." General Electric Co., Ltd., L. C. Jesty, and G. W. Seager. August 17th, 1934. (437624.)
24029. "Electric gas blast circuit-breakers." S. Ruppel. August 19th. 1933. (437472.)
24134. "Electric-discharge tube oscillation generators." General Electric Co., Ltd., and E. C. S. Megaw. August 21st, 1934. (437473.)
24136. "Electric vacuum cleaners." General Electric Co., Ltd., and F. A. Franks. August 21st, 1934. (437550.)
24277. "Electric wire terminals and mountings therefor." Ward & Goldstone, Ltd., and M. H. Goldstone. August 23rd, 1934. (437474.)
24428. "Electric timing devices." Igranic Electric Co., Ltd. August 26th, 1933. (437476.)
27852. "Electrically driven control devices for the rolls of rolling mills." F. Krupp Grusonwerk Akt.-Ges. October 4th, 1933.(Addition to 395916.) (437479.)
28591. "Tuning indicators for radio receivers." Murphy Radio, Ltd., and I. Davies. October 5th, 1934. (437481.)
30949. "Method and device for the regulation of electrically heated windscreens." A. Schwarz. December 30th, 1933. (Cognate applications 30850/34 and 30851/34.) (437402.)
33087. "Apparatus for the electrical precipitation of suspended particles from gases." Lodge-Cottrell, Ltd. (Siemens-Lurgi-Cottrell-Elektrofilter-Ges. für Forschung und Patentverwertung). November 16th, 1934. (437626.)
35213. "Electric welding apparatus." British Thomson Houston Co., Ltd. December 8th, 1933. (437404.)

1935

655. "Machines for pasting accumulator grids." Compagnie General d'Electricité. January 10th, 1934. (437558.)
6553. "Transmitters for electric remote indicating systems." British Thomson-Houston Co., Ltd. March 1st, 1934. (437629.)
7431. "Coupling-arrangement for dial lamps in radio receivers." E. K. Cole, Ltd. April 26th, 1934. (437569.)
9556. "X-ray apparatus." C .H. F. Müller Akt.-Ges. March 28th. 1934. (Addition to 414575.) (437420.)
9909. "Electric accumulators." Compagnie Générale d'Electricité. May 2nd, 1934. (437707.)
11285. "Automatic electric motor-starting devices for telegraph apparatus." R. G. Griffiths. April 11th, 1935. (437499.)
12018. "Electrical synchronising of clocks." R. Rod. April 20th, 1934. (437580.)
13243. "Electric fuses." British Thomson-Houston Co., Ltd. May 5th, 1934. (437503.)
14189. "Electrical condensers." R. Bosch Akt.-Ges. June 8th. 1934. (Cognate application 14190/35.) (437429.)
14998. "Electrical connections, particularly for radio and the like circuits." N. Cave and Baird Television, Ltd. May 23rd, 1935. (437507.)
15078. "Electric switch contacts." British Thomson-Houston Co., Ltd. May 23rd, 1934. (437713.)
17206. "Electric heating plates." British Thomson-Houston Co., Ltd. June 14th, 1934. (437636.)
1707. "Switches of the flush-fitting wall type." A. Aitchison. June 20th, 1935. (437437.)
27548. "Amplifiers for television." Radioakt.-Ges. D. S. Loewe. February 25th, 1933. (Addition to 410147.) (Divided out of 6150/34.) (437641.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 20th:—

Saudamet. No. 559767. Class 5. Unwrought and partly-wrought metal used in manufacture.—Electric Furnace Product Corporation, 30, East 42nd Street, New York, U.S.A. (British representatives: Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Geeco. No. 563599. Class 6. Machinery of all kinds and parts thereof.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

33-kV Oil-filled Cable Installed Vertically

AN unusual installation of 33-kV cable was recently carried out by British Insulated Cables, Ltd., at the Liverpool factory of Messrs. J. Bibby & Sons, Ltd. Due to expansion of load and in order to reduce distribution losses, a new sub-station designed to carry a load of 10,000-kVA was constructed on the roof of the factory near the load centre, and connected to the existing sub-station at which a 33-kV supply is given by Liverpool Corporation. On account of the difficulty of taking the cables through the buildings they are laid underground round the block as far as a point below the new sub-station and there taken inside and cleated vertically for a rise of 140 ft. Two circuits of three 0.1 sq. in. single-core 33-kV oil-filled cables arranged in triangular formation, together with a twenty-core control cable, were run from the existing 33-kV switchgear in Great Howard Street to the bus-bar end-boxes on the switchgear in the new sub-station. From this point four circuits of three 0.06-sq. in. single-core solid 33-kV cables were taken to four 2,000-kVA 33,000/400-V transformers. Each cable was drawn up the building by a winch, being lashed at intervals to the wire hauling rope and when in position transferred to lashings on the studs of the cleats. When the third cable of each circuit was in place the cleats were fixed, beginning from the lower end and the slack between floors taken up by means of block and tackle. During the installation of the cable, oil pressure was maintained by pressure tanks at the lower terminations. These tanks were operated above their normal maximum pressure in order to balance the head due to the vertical rise and maintain a pressure above atmospheric at the upper termination. The cabling between the transformers and the l.v. switchgear consists of four circuits each composed of nine 1.25-sq. in. single core, paper-insulated, lead-covered 600-V cables, three per phase. The portions of the cable installed indoors are finished with non-drip servings of compounded hessian tapes.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abram (LANCASHIRE).—Houses (50), Bickershaw; U.D.C. surveyor.

Bedlington.—Houses (126); J. W. Pooley, U.D.C. surveyor.

Birmingham.—Factory, Adderley Park, for Morris Commercial Cars, Ltd. (£250,000).

Blaydon-on-Tyne.—Houses (26), Highfield estate, for the Burnopfield Co-operative Society; J. J. Eltringham, architect, Hawthorn Terrace, Blackhill.

Boston.—Houses (272); borough surveyor.

Calne.—Schools (£20,000); Blackford & Son, builders.

Cannock.—Houses (32), Longford Road; S. Harrison, architect, Council House, The Green.

Chartham.—Extensions to Kent County Institution (£62,150); J. Seaton Dahl, architect.

Chippenham.—Cinema for Albany Ward Theatres, Ltd.

Darlington.—Houses (20), Springwell Terrace; R. Blackett & Sons, builders, 63, Bondgate.

Deal.—Rebuilding station, for the Southern Railway Co., Ltd.; chief engineer, Cannon Street, London, E.C.4.

Denbighshire.—Central school, Denbigh (£16,490), for County Education Committee; W. R. Samuel, Wrexham.

Derby.—Houses (393), by direct labour; borough surveyor. Cinema, Normanton, on site of the old Pavilion (£30,000); Browning & Hayes, architects, 10, Irongate, Derby.

Dorchester.—Water supply scheme, with electrical work; W. H. Bateman, water engineer.

Dursley (GLOUCESTERSHIRE).—Houses (70); F. N. Wright, builder, Lydney.

Ealing.—Hotel, Ruislip Road; North West London Estates, Ltd., 6a, Sudbury Heights Avenue, Greenford. Shops, North Circular Road; Onyx Property Investment Co., Ltd., Central House, Finsbury Square, E.C.2.

Edinburgh.—Houses (116), Crewe Road; F. B. Thomson, architect, 55, Strachan Road. Government offices (£425,000); Thomas S. Tait, Sir John Burnet, Tait, & Lorne, architects, 1, Montague Place, London, W.C.1.

Essex.—Senior schools, Great Burstead, Rayleigh and South Hornchurch, and enlargement to Little Thurrock Junior School, for County E.C. Senior school, Manningtree (£21,339), and extensions to Secondary school, Woodford; county architect, Chelmsford.

Evesham.—Houses (38), Broadway; R. J. Atkinson, R.D.C. surveyor, 64, Port Street.

Feltham (MIDDLESEX).—Factories, Twickenham Road; R. O. Blott.

Gateshead-on-Tyne.—Houses (558), Deckham Hall estate; John Clark and Son, builders, Gregson Terrace, New Seaham. Dog racing track and ice hockey rink, Eslington Park, for a London syndicate (£80,000); Stephenson & Gillis, architects, 2, Saville Place, Newcastle-on-Tyne.

Glasgow.—Extension to public baths, Clyndes Street, Govan (£25,000); city engineer, City Chambers, Glasgow.

Grangemouth.—Houses (£48,000); burgh surveyor.

Guide Bridge.—Cinema, electrical work; Drury & Gomersall, architects, Imperial Buildings, Oxford Road, Manchester.

Guildford.—Nurses' home, Warren Road Hospital (£16,989); Grace & Marsh, builders.

Hampshire.—Senior school, Cove, for County E.C.

Hanley.—Cinema (£60,000), for Odeon Theatres, Ltd., Birmingham; W. Weedon, architect, Birmingham.

Hemsworth.—Houses (48) and bungalows, Shafton and South Elmsall; engineer and surveyor, Market Buildings.

Hendon.—Shops and flats, Hale Lane; F. Howkins, 1, Russell Parade, Golder's Green, N.W.11.

Heston.—Bank, Great West Road; National Provincial Bank, Ltd. Factory, Great West Road; Allnatt, Ltd.

Holmes Chapel (CHESHIRE).—Works, with staff quarters and laundry, for Bengers Food, Ltd., Manchester.

Irish Free State (BUTTEVANT, CO. CORK).—Installation of electric lighting to sanatorium for the Joint Committee of Management of Cork Sanatorium, Courthouse, Cork; McArtur & MacEntee, electrical engineers, 8, Dawson Street, Dublin. (PASSAGE WEST, CO. CORK).—Houses (34), Passage West; J. R. Boyd-Barrett, architect, 61, South Mall, Cork.

Irvine.—Explosives factory, for Imperial Chemical Industries, Ltd.

Kent.—Extensions to Grange Sanatorium, Leybourne (£119,337), York Road School, Dartford, and Girls' Grammar School, Rochester; county architect, Maidstone.

Lanarkshire.—Junior instruction centres, Burnbank and Coatbridge, with heating and electrical work, for C.C.; J. Stewart, county architect, Albert Street, Motherwell.

Lancashire.—Hospital for 3,000 patients, Lathom Park estate, Ormskirk, and extensions, Brockhall Institution (£597,600), for the Mental Hospitals Board; clerk, Preston.

Lawford.—Houses (25); Parsons & Sons, South Street, Manningtree.

Leamington Spa.—Houses (52), Shrubland estate; G. F. Smith & Son, builders, Leamington.

Leicestershire.—Extensions to Grammar Schools, Market Bosworth, and Market Harborough, for County E.C.

Leyland (LANCASHIRE).—Council offices, with fire station, &c. (£20,753); U.D.C. surveyor.

Lincoln.—Nurses' home, for Brace Bridge Mental Hospital Visiting Committee (£36,000); H. S. Hall, architects, 32, Old Market Place, Grimsby.

Lincolnshire.—Elementary school, Hogsthorpe, for County E.C.; P. W. Birkett, county architect, County Offices, Lincoln.

London.—(Bow).—Reconstruction of Roman Road School (£43,670); L.C.C. architect. (GREENWICH).—Reconstruction of Haddo Street (£53,000); L.C.C. architect. (ISLINGTON).—Remodelling, Newington Green school (£38,130); L.C.C. architect. (ST. MARYLEBONE).—Houses, Harrow Street (£120,000); L.C.C. architect. (GREENWICH).—Flats, Lamb Lane, by direct labour (£47,394); borough engineer. (HACKNEY).—Tenements (101), Duncan Square (£38,293); W. Lawrence & Son, Ltd., 31, Sun Street, E.C.2. (HOUNDSDITCH).—Premises (£22,000) for the Westminster Watch Co., Ltd., 75, Aldgate High Street, E.C.3. (STEPNEY).—Redevelopment of Chicksand Street area (£65,000); L.C.C. architect. (WOOLWICH).—Flats and cottages, Horn Park estate, by direct labour (£65,096); borough engineer.

Longbenton (NORTHUMBERLAND).—Houses (61), Annitsford; U.D.C. surveyor.

Macclesfield.—Extensions to dye works, Exchange Street, for Brough & Co. (Macclesfield), Ltd.; Bellfield & Lovatt, builders, James Street. Houses (37-acre site); borough surveyor.

Manchester.—Houses (32), Howard Road and Clark Avenue, Gorton; Howard & Clark, 61, Hyde Road, Gorton. Cinema, Stockport Road and North Western Street; S. Eidinow, 41, Nightingale Lane, Tooting, London, S.W.12. Electrical accessory factory, Northenden Industrial area, for Victor H. Iddon, Ltd., 29, Blackfriars Street, Manchester; Alfred Hodkinson, Ltd., builders, 62, Greenhill Street, Greenheys, Manchester.

Monmouthshire.—Junior mixed school and infants' schools, Rumney, for County E.C.; secretary to Education Committee, County Hall, Newport.

Newbury.—Extensions to district hospital, Andover Road; governors. Extensions to works, King's Road; Newbury Diesel Co., Ltd.

Newcastle-on-Tyne.—Houses, Pottery Bank area; R. G. Roberts, housing architect, 18, Cloth Market. Houses, West Road, Benwell Park estate; Hadden & Hillman, builders, Huddlestone Road. Cinema on site of the old police station, Westgate Road, for Essoldo Theatres (Newcastle), Ltd.; Sanderson, Son & Townend, estate agents, 3, Mosley Street. Shops and offices, Shields Road, for G. Wilkes & Son; J. N. Fatkin, architect, Bigg Market. Extensions to the Shotley Bridge Mental Colony, for C.C. (£38,000); J. Solomon, city architect.

Newport (MONMOUTHSHIRE).—Houses (100), Maesglas and Cromwell Road estates; borough architect.

Norwich.—Extensions to factory (£25,000), for the Norvic Shoe Co., Ltd.; J. Youngs & Sons, Ltd., builders.

Onchan (I.O.M.).—Extensions to Majestic Lido Hotel, including 40 staff rooms and bedrooms; proprietors.

Paignton.—Houses (50), Primley Park; E. C. & R. G. Rees.

Perivale.—Factory, Bideford Avenue, for Mr. Jay; Percy Bilton (Properties), Ltd., 113, Park Street, London, W.1.

Pontefract.—Factory, Baghill House estate, for Pearsons (Pontefract), Ltd.; T. F. Pearson, managing director.

Ramsbottom (LANCASHIRE).—Houses (102); A. Plunkett, U.D.C. surveyor.

Romford.—Extensions to nurses' home, Oldchurch Hospital (£34,520); Hosking & Son, Ltd.

Rowlands Gill (CO. DURHAM).—Houses (26), Smailes Lane, for the Burnopfield Co-operative Society; J. J. Eltringham, architect, Derwent Street, Blackhill, Co. Durham.

Rugeley (STAFFORDSHIRE).—Houses (45); W. E. Rogers, architect.

Saltash.—Houses (70), Warfelton Housing estate; F. J. Harris, surveyor, Church House.

Seaham Harbour.—Houses (46); W. Tomlin, builder, Dene Croft, Love Lane.

Sheffield.—Houses (900), Sheffield to Hathersage Road and Long Lane, Whirlowdale; James Laver & Sons, Ltd., builders, 44, Greenhill Road.

Southampton.—Factory for British Marine Aircraft, Ltd.

Staines.—Extension to factory, Staines Road; Marley Tile Co.

Stirling.—Houses (378); burgh surveyor.

Stockport.—Senior and junior schools (1,000 places), Didsbury Road; A. Lawton, director of education.

Sunderland.—Houses (300); R.D.C. surveyor, J. Street. Alterations to the "Grand Hotel"; E. M. Lawson, architect, 19, Ridley Place, Newcastle-on-Tyne. Alterations to Martins Bank, Fawcett Street; G. E. Matkin, architect, Barclays Bank Chambers, Fawcett Street.

Surrey.—Central schools, Cromwell Road, Walton-on-Thames, and Park Farm, Cheam (£13,980), for County E.C.; secretary, Kingston-on-Thames.

Thirsk (YORKSHIRE).—Houses (44); C. W. C. Needham, architect, Dunscombe Place, York.

Wallasey.—Development of Palace site; Morris & Webber. School, East Way; Quiggin & Gee, architects. Reconstruction of 278-280, Liscard Road; Boots Cash Chemists, Ltd.

Wallingford.—Houses (34); borough surveyor.

Walsall.—Factories, Bescot Crescent; W. T. Collyer and H. Smith, Birmingham.

Wembley.—Estate development, East Lane; Wm. Smirk (Estates), Ltd.

West Hartlepool.—Houses (20), The Oval; Watt Brothers, builders, Roker Street.

West Sussex.—Two schools, Peacehaven, for County E.C.

Whitburn (WEST LOTHIAN).—Houses (200), Bog Road site; R. J. Glass, burgh surveyor, County Offices, Glasgow Road, Bathgate.

Whitley Bay.—Cinema at the junction of Seatonville Road and Cauldwell Lane, for the Regal Co., Ltd.; Dixon and Bell, architects, Pearl Buildings, Northumberland Street, Newcastle-on-Tyne. Alterations and additions to the Station Hotel; H. D. Burton, Ltd., builders, King Street, North Shields.

Widnes.—Houses (156), Lugsdale Road rehousing site; borough engineer.

Willington (CO. DURHAM).—Houses (150); J. H. Gardner, U.D.C. surveyor, Council Offices.

Woking.—Business stores, Chertsey Road and Chobham Road, for Montague Burton, Ltd., Leeds.

Wolstanton.—Houses (540), Highfields Farm estate; T. W. Jones, builder, Chesterton.